NASA Facts

National Aeronautics and
Space Administration

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(202) 358-1600

For Release

January 1996

Space Shuttle Program Changes
and Accomplishments Since 1986

Changes After the Challenger Accident

- Following the Challenger accident, NASA conducted an exhaustive review to understand the causes of the tragedy and made extensive changes to critical systems in an effort to promote safety and reliability. After many months, the program resumed flight operations in September 1988.

- On June 6, 1986, the Presidential Commission on the Space Shuttle Challenger Accident (also known as the Rogers Commission, after Chairman William P. Rogers) submitted its report to the President. The report included nine recommendations for restructuring the Shuttle program and safely returning the Shuttle to flight. On June 13, 1986, President Reagan directed NASA to implement those recommendations as soon as possible. On July 14, 1986, NASA reported to the President on its plans and progress for implementing each of those recommendations.

- The Solid Rocket Motors were extensively redesigned following the accident. This involved recertifying the boosters through a series of test firings at the Morton Thiokol facility in Utah. The redesign added an extra O-ring to the joints between the rocket segments, and greatly strengthened the physical connection between the segments. Heaters were added to the joints to prevent cold weather from affecting the sealing capability of the O-rings.

- In addition to the redesign of the Solid Rocket Motor, and in line with the Rogers Commission findings, extensive landing safety improvements were made. This included upgrades of the Space Shuttle Orbiter tires, brakes and nose wheel steering mechanism, and a drag chute system was added.

- Numerous hardware, software and safety improvements were incorporated, including the installation of a crew escape system that allows astronauts to parachute from the Orbiter under certain conditions.

- Risk identification and reduction programs were put in place.

- The Space Shuttle program was reorganized to ensure all necessary information was available to managers at all levels. Also in line with the

-more-

Rogers Commission findings, experienced astronauts were placed in senior positions within the program management structure. Since the accident, astronauts have had a decisive voice in determining NASA's readiness to fly Shuttle missions.

- All program documentation was reviewed, and previous waivers to flight rules or launch criteria were revoked. Re-establishment required detailed analyses by both contractor and civil service personnel at all levels of management.

- Any technical issue that arises in the course of preparing for a given Shuttle mission is subjected to independent assessment by the government workforce. In addition, NASA has encouraged independent oversight of various program issues from a variety of groups, including the National Research Council.

- Through a series of open reviews, all significant issues and open items are elevated to a Flight Readiness Review Board chaired by the Associate Administrators for Space Flight and Safety. Through this process, full and open discussions of all potential issues is encouraged, and these issues are reviewed and assessed by all levels of program management, engineering, and safety organizations.

- In addition to the formal open communication system, a system is in place to provide a mechanism for anonymous reporting of safety concerns.

Shuttle Mission Highlights

- The first Shuttle flight after the Challenger accident was STS-26 aboard the Discovery in September 1988.

- Including the January 1996 flight (the NASA designation is STS-72), there have been 49 Shuttle missions since Challenger. Prior to Challenger, there were 24 Shuttle missions. Counting all Shuttle missions to date, including the Challenger, there have been 74 flights.

- Since April 1981, the Shuttle has carried approximately 2 million pounds of cargo and 699 major payloads into orbit.

- Since 1986 (and including the current mission), the Shuttle fleet has had 49 successful launches.

- Since 1986, the Shuttle has launched the Magellan spacecraft to Venus, the Galileo spacecraft to Jupiter and the Ulysses spacecraft to study the Sun. The Shuttle also has deployed the Gamma Ray Observatory, the Hubble Space Telescope, and the Upper Atmosphere Research Satellite.

Space Shuttle Statistics in General

- In 74 flights, the Shuttle fleet has accumulated 580 days of flight time, 426 days since the Return to Flight in September 1988. That equates to 9.33 years of total person time in space, 7.05 years since the Return to Flight.

- The Shuttle has flown 419 total crew members, 366 of whom were male and 53 of whom were female. Since many of those crew members flew more than once, the number of individuals flown has been 181 males and 26 females.

- Through STS-72, a total of 9,141 tons of Orbiter and cargo have been launched, including 1,258 tons of payload and supporting hardware, and 545 tons deployed and left in space. During two docking flights, 6 tons have been delivered to the Mir space station, and 0.9 tons have been retrieved from the Mir. The Shuttles have retrieved 18.5 tons of payload from orbit.

- Through STS-72, the Shuttle has flown a total of 699 payloads, including 300 for NASA, 143 for the Department of Defense, 106 for commercial interests, 76 for other nations, and 74 educational payloads.

- Through STS-72, the Shuttle has deployed a total of 53 payloads, including three interplanetary spacecraft (Magellan, Galileo and Ulysses), 33 geosynchronous Earth-orbit satellites, 9 small satellites, and one component -- a new docking module -- for the Mir space station.

- Through STS-72, the Shuttle has retrieved 21 payloads -- 12 were deployed and retrieved on the same flight, and 9 were retrieved for repair, refurbishing or analysis.

- The U.S. Space Shuttle remains the only vehicle in the world with the dual capability to deliver and return large payloads to and from orbit. The design, now more than two decades old, is still state-of-the-art in many areas, including computerized flight control, air frame design, electrical power system, thermal protection system and main engines.

- Through STS-72, astronaut crews have conducted 32 extravehicular activities (spacewalks), 18 since the Return to Flight in 1988.

- The Shuttle is the most reliable launch system now in service anywhere in the world, with a success-to-failure ratio (as of STS-72) of .986.

- Since 1981, the Shuttle fleet has flown over 225 million miles in space, in excess of the distance from Earth to the Sun and back.

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News Release

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For Release
January 11, 1996

RELEASE: 96-1

MARSHALL CENTER DIRECTOR TO RETIRE

G. Porter Bridwell, Director of the NASA Marshall Space Flight Center, Huntsville, AL, today announced plans to leave his position and retire from NASA by Feb. 3. Bridwell, 60, has been director of the NASA center since January of 1994.

"I've been out here for 38 years, 34 of it with NASA," he told his senior staff this morning, "it's time to go."

"During his long career, Porter Bridwell has epitomized all the best qualities of federal service," said NASA Administrator Daniel S. Goldin. "And, as Marshall Director over the last two years, he has paved the way in restructuring the Center and defining its new role for the future. At my request, he initiated a comprehensive study of how Marshall will lead NASA and the nation in developing new concepts for rocket propulsion and launch. His contributions will pay dividends to the space program for decades to come, particularly in the critical area of reusable launch vehicles."

Bridwell started his career as an aerospace industry engineer in 1958, joining NASA four years later. He served as an engineering manager on the Saturn program, headed the development of the Space Shuttle External Tank, and managed all the Space Shuttle main propulsion systems while at Marshall. He also served as director of the Institutional and Program Support Directorate, and headed efforts to develop a new heavy lift launch vehicle.

In two NASA assignments away from Huntsville, he served as acting director of the Stennis Space Center in Mississippi (1987), and served at NASA Headquarters (1993-1994) on the Space Station redesign team and as leader of the team that handled initial integration of the Russian elements into the International Space Station program.

Bridwell has received the NASA Exceptional Service Medal, the Outstanding Leadership Medal, and the Exceptional Achievement Medal. In 1989, the President of the United States awarded him the rank of Meritorious Executive.

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Contract Announcement

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For Release
January 16, 1996

RELEASE: c96-a

SVERDRUP TECHNOLOGY SELECTED FOR SCIENCE AND ENGINEERING SERVICES CONTRACT

Sverdrup Technology, Inc., Tullahoma, TN, has been selected for final negotiations leading to the award of a five-year contract for science and engineering services for the Science and Engineering Directorate at NASA's Marshall Space Flight Center, Huntsville, AL. The estimated value will be approximately $73 million.

Under the contract, Sverdrup will provide engineering and scientific services to Marshall in the areas of systems analysis and integration, propulsion, astrionics, materials and processes, structures and dynamics, and space science.

Marshall officials anticipate that a cost-plus-award-fee contract will be negotiated with a period of performance of one year, plus four one-year priced options and five options for increasing the amount of support during the period of performance.

Marshall's Science and Engineering Directorate accomplishes science and engineering activities associated with the design, development, testing, mission operations and evaluation of launch vehicle space transport systems, payloads, and other programs and projects.

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NOTE TO EDITORS: N96-1

BRIEFING SET TO ANNOUNCE EARLY GALILEO PROBE RESULTS

Scientists analyzing data returned by NASA's Galileo atmospheric probe into Jupiter will unveil early scientific discoveries during a news briefing at 1 p.m. EST on Monday, Jan. 22, at NASA's Ames Research Center, Mountain View, CA.

Project scientists and principal investigators will present results from the probe's six instruments based on their initial looks at data collected Dec. 7 during the probe's fiery 57-minute descent through the giant gas planet's upper atmosphere. New animation portraying this event also will be available.

Originally scheduled for Dec. 19, 1995, this briefing was postponed by the government-wide furlough.

Information and photographs about the Galileo mission to Jupiter can be accessed through the following URLs: http://ccf.arc.nasa.gov/dx or http://ccf.arc.nasa.gov/galileo_probe/

The briefing will be carried live on NASA Television via Spacenet 2 Transponder 5, Channel 9, at 69 degrees West longitude. The frequency is at 3880.0 megahertz, audio at 6.8 megahertz.

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Video Advisory

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For Release

January 16, 1996

VIDEO ADVISORY: V96-1

NEW HUBBLE SPACE TELESCOPE IMAGES ON NTV WEDNESDAY

On Wednesday NASA Television will air dramatic new images from the Hubble Space Telescope showing a vast dust disk around the star Beta Pictoris. The new image, as well as animation, will discuss how this discovery by Hubble may help scientists better understand theories behind the formation of our solar system.

NASA TV also will continue to provide live coverage of the current STS-72 Space Shuttle Endeavour mission. On Wednesday astronauts will continue their nine-day mission by performing another space walk that will help prepare them for the building of the international Space Station. Endeavour is currently set for landing at the Kennedy Space Center, FL, this Saturday at approximately 3 a.m. EST.

Wednesday's video news file will air at 12:30 p.m., 3 p.m., and 5 p.m. EST.

ITEM #1: HUBBLE REVEALS VAST DUST DISK
Image shows first time view of inner region of a dust disk around star Beta Pictoris.

ITEM #2: BETA PICTORIS ANIMATION
Animation illustrates one possible explanation for a warped disk of dust encircling Beta Pictoris.

ITEM #3: CIRCUMSTELLAR DISK COLLAPSE ANIMATION
Animation shows common theory for the formation of our solar system.

ITEM #4: INTERVIEW WITH DR. CHRIS BURROWS
Space Telescope Science Institute investigator explains how this image is the first time scientists have seen something resembling our own solar system..

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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RELEASE: 96-2

ADMINISTRATOR GOLDIN ISSUES STATEMENT ON CHALLENGER OBSERVANCE

NOTE: The following statement by NASA Administrator Daniel S. Goldin was released today in observance of the upcoming 10th anniversary of the Challenger accident.

"The best way to honor the memories of the crew of the Challenger, and of all the men and women who have given their lives to explore the frontiers of air and space, is to continue their bold tradition of exploration and innovation. That's what the people of NASA do every day. They push the boundaries of knowledge and human endeavor to improve and enrich life on Earth today and secure a better future for all of us tomorrow.

"I've said many times that safety is the highest priority at today's NASA. We will not waver from that commitment. But human beings have always taken great risks to reap great rewards. Space flight is inherently dangerous and every member of the NASA team understands those risks.

"I'm proud of the women and men of NASA. They're blazing the trail to the future. They're building the components of the International Space Station. They're constructing spacecraft that will explore the farthest regions of the Solar System and the universe, and satellites that will monitor the health of our own blue planet for years to come. They're conducting cutting edge research that will make airplanes faster and safer, and they've made the Space Shuttle the most capable, reliable and versatile spacecraft in the world."

- end -

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For Release
January 16, 1996

RELEASE: 96-3

LITTLES NAMED DIRECTOR OF MARSHALL SPACE FLIGHT CENTER

Dr. J. Wayne Littles has been named the new Director of the Marshall Space Flight Center in Huntsville, AL, NASA Administator Daniel S. Goldin announced today. Littles will assume his new post on Feb. 3.

Littles currently serves as the Associate Administrator for the Office of Space Flight. He will replace G. Porter Bridwell, who announced Jan. 11 he was retiring from NASA after 34 years of service.

"Dr. Littles has the necessary managerial and technical experience to lead Marshall into the 21st century," Goldin said. "As the Agency's Center of Excellence for space propulsion, I want Marshall to lead the world in research and development of next generation propulsion systems. Dr. Littles is uniquely qualified to provide the leadership necessary to meet that challenge."

Pending selection of a replacement, Wilbur Trafton, who currently serves as the director of the international Space Station program, will be the acting Associate Administrator for the Office of Space Flight.

As the head of the Office of Space Flight, Littles directed both the Space Shuttle and Space Station programs for NASA. During his tenure, NASA restructured the Space Station program, streamlined the management of the program by putting it under a single prime contractor, and led discussions with the Russian Space Agency concerning their participation and contributions to the international Space Station.

Littles has led the Space Shuttle program through an extensive redefinition of requirements and put in place a restructured program which has achieved significant cost savings while maintaining safety as the highest priority. Most recently, Littles has been leading the effort to consolidate Shuttle operations under a single prime contractor to further reduce overlap, streamline operations and reduce costs.

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Littles will be returning as director of the same NASA Center where he began his federal career in 1967 as an engineer in the former Propulsion and Vehicle Engineering Directorate. Littles spent 24 years at Marshall in positions of increasing responsibility, eventually becoming the Deputy Director in July 1989.

He left Marshall in January 1994 when Goldin named him as the Agency's Chief Engineer where he oversaw the technical readiness and execution of all NASA programs. He was named to the post of Associate Administrator for Space Flight in November 1994.

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RELEASE: 96-4

ASTRONAUT THAGARD LEAVES NASA; RETURNS TO ALMA MATER

Space Shuttle Astronaut Dr. Norman E. Thagard has retired from NASA and returned to his alma mater, Florida State University. He leaves the space agency following five space missions, including a U.S. record four-month stay aboard Russia's space station Mir.

Thagard accepted the position of Visiting Professor and Director of External Relations for the Florida A&M University - Florida State University College of Engineering, Tallahassee. His initial assignment -- effective Jan. 5 -- is teaching electronics, an area that has been a long-time hobby. Thagard has published several articles on digital and analog electronics design.

Joining NASA as part of the astronaut class of 1978, Thagard flew on STS-7 in 1983 and STS 51-B in 1985, both aboard Challenger; STS-30 in 1989 on Atlantis; STS-42 in 1992 on Discovery; and on the Mir-18 mission on the space station last year. On that flight Thagard was launched with two cosmonauts aboard a Soyuz rocket and landed aboard Atlantis at the conclusion of the first Shuttle/Mir docking mission -- STS-71.

Becoming an astronaut was one of Thagard's dreams. Another was to return to his alma mater, from which he received bachelor and master of science degrees in engineering science in 1965 and 1966, respectively. "The only thing other than being an astronaut was to come back to Florida State to teach," Thagard said. His doctor of medicine degree came in 1977 from the University of Texas Southwestern Medical School.

Though born in Marianna, FL, Thagard considers Jacksonville his hometown. He is a pilot and has logged more than 2,200 hours flying time, primarily in jet aircraft. With the completion of his fifth space mission, Thagard has spent over 140 days in space -- more than any other American.

-end-

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January 16, 1996

RELEASE: 96-5

ASTRONAUTS FOALE, VOSS JOIN COLLEAGUES IN STAR CITY, RUSSIA

Three-time Space Shuttle veteran C. Michael Foale, Ph.D., has joined fellow astronauts training at the Gagarin Cosmonaut Training Center in Star City, Russia, for stays on Russia's Mir space station. Foale will be the fifth and final astronaut currently scheduled to stay on Mir as part of the first phase of the International Space Station program. James S. Voss (Colonel, USA) will serve as Foale's backup.

Foale will train as the backup to Jerry M. Linenger, who will be the fourth astronaut to stay aboard Mir as part of the first phase leading toward development and construction of the International Space Station. Foale then will be the prime crew member for a subsequent Mir stay targeted for late 1996.

Shannon W. Lucid, the next astronaut to stay on Mir, will be launched on the third docking mission scheduled for March (STS-76). She will return home following a five-month stay and be replaced by John E. Blaha on the STS-79 mission of Atlantis. Blaha will spend about four months on Mir as a prime crew member for the Mir-22/23 crews. The two veteran Shuttle astronauts have been training in Star City since last February.

Linenger will replace Blaha on Mir, launching aboard Atlantis on STS-81 for a five month mission with the Mir-23/24 crews. Foale will launch on STS-84 to replace Linenger and will spend about four months on the space station with the Mir 24/25 crews. Voss will serve as a backup crew member and is not scheduled for a long-duration stay on Mir.

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"The current flight assignments reflect both prime and backup crew members for the docking missions to Mir," said Frank Culbertson, Acting Director, Phase I (Shuttle/Mir) Program. "Each of these individuals is extremely talented and all are proven performers in space flight. Both the U.S. and Russian programs will benefit from their experience and their expertise as we continue with these cooperative missions."

The flight assignments for the five astronauts are:

Flight	Prime	Back-up	To Mir	Return
Mir 21/22	Shannon Lucid	John Blaha	STS-76	STS-79
Mir 22/23	John Blaha	Jerry Linenger	STS-79	STS-81
Mir 23/24	Jerry Linenger	Mike Foale	STS-81	STS-84
Mir 24/25	Mike Foale	Jim Voss	STS-84	STS-86

Foale, 38, flew on STS-45 aboard Atlantis in 1992, Discovery's STS-56 mission in 1993 and most recently on the STS-63 mission in February which saw Discovery rendezvous with Mir, approaching to within 37 feet of the space station. He considers Cambridge, England, his hometown. Foale completed his doctorate in laboratory astrophysics at Cambridge University in 1982.

Voss, 46, flew on Altantis' STS-44 mission in 1991, STS-53 aboard Discovery in 1992 and most recently on STS-69 aboard Endeavour in September. He considers Opelika, AL, his hometown. Voss earned a bachelor of science degree in Aerospace Engineering from Auburn University in 1972 and a master of science degree in Aerospace Engineering Sciences from the University of Colorado in 1974.

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News Release

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For Release

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January 17, 1996

NOTE TO EDITORS: N96-2

NEW HUBBLE IMAGES AVAILABLE

Six new images from NASA's Hubble Space Telescope, released this week at the American Astronomical Society meeting in San Antonio, TX, are available to media representatives.

These images are available via the World Wide Web and the Internet at URL: **http://www.hq.nasa.gov/office/pao/NewsRoom/today.html** or by printed copy by faxing your request on your organization's letterhead to the Headquarters Imaging Branch at 202/358-4333.

The images are:

- The deepest, most detailed optical view of the universe ever obtained, called the Hubble Deep Field (HDF), was assembled from 342 separate exposures taken with the Wide Field and Planetary Camera 2 for ten consecutive days between December 18 and 28, 1995. Representing a narrow "keyhole" view stretching to the visible horizon of the universe, the HDF image covers a speck of the sky only about the width of a dime located 75 feet away. Though the field is a very small sample of the heavens, it is considered representative of the typical distribution of galaxies in space because the universe, statistically, looks largely the same in all directions. Gazing into this small field, Hubble uncovered a bewildering assortment of at least 1,500 galaxies at various stages of evolution.

  Color: 96-HC-5 B&W: 96-H-5 (single image)
  Color: 96-HC-2 B&W: 96-H-2 (three views of sample galaxies)

- An image of planetary nebula NGC 7027 shows remarkable new details of the process by which a star like the Sun dies. New features include: faint, blue, concentric shells surrounding the nebula; an extensive network of red dust clouds throughout the bright inner region; and the hot central white dwarf, visible as a white dot at the center. The nebula is a record of the star's final death throes. Initially the ejection of the star's outer layers, when it was at its red giant stage of evolution, occurred at a low rate and was spherical. The photo reveals that the initial ejections occurred episodically to produce the concentric shells.

  Color: 96-HC-4 B&W: 96-H-4

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- An image of a warped disk around the star Beta Pictoris may indicate the presence of a planet around the star. The image shows for the first time the inner region of a 200-billion mile diameter dust disk around Beta Pictoris. The disk is slightly warped, and scientists believe that if the warp were there when the star formed it would long since have flattened out, unless it is produced and maintained by the gravitational pull of a planet.

  Color: 96-HC-3 B&W: 96-H-3

- This photo reveals the first direct image of a star other than the Sun. Called Alpha Orionis, or Betelgeuse, it is a red supergiant star marking the shoulder of the winter constellation Orion the Hunter. The image reveals a huge ultraviolet atmosphere with a mysterious hot spot on the stellar behemoth's surface. The enormous bright spot, more than ten times the diameter of Earth, is at least 2,000 Kelvin degrees hotter than the surface of the star. The image suggests that a totally new physical phenomenon may be affecting the atmospheres of some stars.

  Color: 96-HC-11 B&W: 96H-11

- An image of the Egg Nebula, also known as CRL2688 and located roughly 3,000 light-years from us, was taken in red light with the Wide Field and Planetary Camera 2 aboard NASA's Hubble Space Telescope. The image shows a pair of mysterious "searchlight" beams emerging from a hidden star, criss-crossed by numerous bright arcs. This image sheds new light on the poorly understood ejection of stellar matter which accompanies the slow death of Sun-like stars.

  Color: 96-HC-25 B&W: 96-H-25

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January 17, 1996

RELEASE: 96-6

ASTRONAUTS SELECTED FOR STS-80, STS-83 SHUTTLE MISSIONS

Kenneth D. Cockrell will command the third flight of the Wake Shield Facility (WSF) aboard Columbia (STS-80) scheduled for November 1996. He will be joined on the flight by Pilot Kent V. Rominger (Commander, USN), and Mission Specialists Tamara E. Jernigan, Ph.D., Thomas David Jones, Ph.D. and Dr. Story Musgrave.

In addition, Janice Voss, Ph.D., and Donald A. Thomas, Ph.D., have been named payload commander and mission specialist, respectively, for the long-duration microgravity science laboratory flight of Columbia (STS-83) scheduled for spring 1997. The commander, pilot, flight engineer and payload specialists will be named at a later date.

STS-80 will mark the third flight of the WSF that flew on STS-60 and STS-69 and the second flight of the Orbiting Retrievable Far and Extreme Ultraviolet Spectrometer (ORFEUS) satellite. Both satellites will be deployed and retrieved during the mission.

The saucer-shaped WSF is designed to fly free of the Shuttle, creating a super vacuum in its wake in which to grow thin film wafers for use in semiconductors and other high-tech electrical components. The ORFEUS instruments are mounted on the reusable Shuttle Pallet Satellite and will study the origin and makeup of stars.

Astronauts Jernigan and Jones will conduct a spacewalk during the mission to continue the flight test and evaluation of hardware for future spacewalks or extravehicular activity.

Columbia's next flight after STS-80 will be a 16-day mission to conduct multiple experiments in materials science research in a pressurized laboratory mounted in the payload bay. As payload commander, Voss will oversee the long-range planning and organization necessary for that mission.

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Cockrell, 45, will be making his third flight on the Shuttle. He flew aboard Discovery on STS-56 in April 1993 and most recently on STS-69 aboard Endeavour in September 1995 -- the second flight of WSF. A Captain in the Naval Reserve, Cockrell joined NASA in 1987 as an aerospace engineer, research pilot and instructor for the Aircraft Operations Division at Johnson Space Center. He earned a master of science degree in aeronautical systems from the University of West Florida in 1974. Cockrell was born in Austin, TX.

Rominger, 39, completed his first Shuttle flight in October 1995 aboard Columbia on the STS-73 mission. He came to NASA in 1992 after serving as an operations officer aboard the USS Nimitz in the Arabian Gulf during Desert Storm. Rominger was born in Del Norte, CO, and earned a master of science degree in aeronautical engineering from the U.S. Naval Postgraduate School in 1987.

Jernigan, 36, has flown three times on the Shuttle: STS-40 on Columbia in June,1991, STS-52 on Columbia in October,1992, and STS-67 aboard Endeavour in March,1995. She joined the Astronaut Corps in 1985 after serving as a research scientist at the Ames Research Center, Moffett Field, CA. Jernigan was born in Chattanooga, TN, and earned her doctorate in space physics and astronomy from Rice University in 1988.

Jones, 40, flew on two Shuttle missions aboard Endeavour in April and October, 1994 (STS-59 and STS-68) to assist in the operation of the Space Radar Laboratory. He joined NASA in 1990 after serving as a program management engineer at the Central Intelligence Agency's Office of Development and Engineering and as a senior scientist at Science Applications International Corp. in Washington, DC. Prior to that, Jones was a B-52 pilot and aircraft commander. He was born in Baltimore, MD, and earned a doctorate in planetary science from the University of Arizona in 1988.

Musgrave, 60, has flown on five Shuttle missions. He flew on Challenger's maiden voyage (STS-6) in April 1983 and participated in the first Shuttle spacewalk. He then flew on STS-51F aboard Challenger in July/August, 1985, STS-33 on Discovery in November, 1989, and STS-44 aboard Atlantis in November, 1991. Musgrave conducted three of the five spacewalks on his most recent flight -- the first Hubble Space Telescope (STS-61) servicing mission -- aboard Endeavour in December, 1993. He earned his doctorate in medicine from Columbia University in1964. Musgrave considers Lexington, KY, his hometown.

Voss, 39, flew on STS-57 aboard Endeavour in June,1993 and STS-63 aboard Discovery in February, 1995, the Shuttle mission that conducted a rendezvous within 37 feet of the Russian Space Station Mir. Voss earned her doctorate in aeronautics/astronautics from the Massachusetts Institute of Technology in 1977. She considers Rockford, IL, her hometown.

Thomas, 40, will be making his third flight aboard the Shuttle. He flew on a 15-day microgravity laboratory mission aboard Columbia in July, 1994 (STS-65) and most recently on STS-70 aboard Discovery in July, 1995 to deploy a Tracking and Data Relay Satellite. Thomas earned a master of science and doctorate from Cornell University in 1980 and 1982, respectively. He was born in Cleveland, OH.

- end -

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Don Nolan-Proxmire
Headquarters, Washington, DC
(Phone: 202/358-1983)

January 17, 1996

Michael Mewhinney
Ames Research Center, Moffett Field, CA
(Phone: 415/604-3937)

RELEASE: 96-7

NASA AMES DIRECTOR TO TAKE TOP MOFFETT FIELD POST

Dr. Ken K. Munechika, currently Director of NASA's Ames Research Center, has been named to a newly-created position as Director of the Moffett Federal Airfield, effective March 4, NASA Administrator Daniel S. Goldin announced today.

"This move reflects the increasing importance of California's Moffett Field to its current and future occupants and to the Silicon Valley," Goldin said.

Since July, 1994 when Naval Air Station Moffett Field was disestablished, NASA has served as the host agency for this federal facility currently occupied by more than 10,000 active duty military, civilian and military reserve personnel.

"I am pleased with this selection and believe this appointment is in the best interest of the Agency, and will strengthen Ames as part of the Moffett complex. A robust future for Moffett Federal Airfield that has the support of the surrounding communities is an extremely important complement to the Research Center infrastructure," Munechika said.

Munechika, 60, will continue to report directly to Dr. Robert E. Whitehead, NASA's Associate Administrator for Aeronautics. In his new position, Munechika will be responsible for the overall management of the airfield and will serve as the senior NASA interface with the resident federal agencies. Currently those agencies include the Naval Air Reserve, Santa Clara, the 129th Rescue Wing California Air National Guard, Onizuka Air Station Annex, the 63rd U.S. Army Command and numerous other government agencies and their contractors.

- more -

Munechika will be responsible for seeing that the resident agencies and the Ames Research Center are provided with all the services normally associated with a federal airfield, including control tower operations, crash, fire and rescue operations and repair and maintenance of all airfield facilities. He also will establish policies for all resident agencies to share in the airfield's operating costs.

In addition, he will chair or serve on major agency and interagency committees and task groups to investigate and make recommendations on issues of national importance related to aerospace. Munechika will also continuously monitor the progress of the airfield's activities to ensure they comply with NASA's objectives.

Prior to joining NASA, Munechika served as the executive director for the Office of Space Industry for the State of Hawaii, where he directed the planning, evaluation and coordination of space-related activities in Hawaii. Prior to that, Munechika served for 31 years in the U.S. Air Force, including more than 20 years in the aerospace field. He served as senior commander of Onizuka Air Force Base before retiring as a colonel in 1989.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

January 19, 1996

Donald Savage
Headquarters, Washington, DC
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Jim Sahli
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-0697)

George Diller
Kennedy Space Center, FL
(Phone: 407/867-2468)

Luther Young
Johns Hopkins University/Applied Physics Laboratory, MD
(Phone: 301/953-6268)

NOTE TO EDITORS: N96-3

LAUNCHES AND SCIENCE BRIEFINGS SCHEDULED FOR POLAR AND NEAR

NASA managers yesterday approved the schedule for the launches of the upcoming Polar and Near Earth Asteroid Rendezvous (NEAR) missions, both to be launched on Delta-II rockets built by McDonnell Douglas. The strategy calls for processing to proceed towards launch on February 2 for Polar at Vandenberg Air Force Base, CA (VAFB) and February 16 for NEAR at Cape Canaveral Air Station, FL (CCAS).

However, on or before January 26, the management team will again assess the situation based on the readiness of NEAR. If processing on NEAR is on schedule with no known constraints to meet its February 16th launch, the Polar launch will be rescheduled to February 22. Managers explain that since a single Delta launch team is responsible for both launches, there is not sufficient turnaround time to support a February 2 launch on the West coast and a February 16 launch on the East coast. There is no constraint to a February 22 launch of Polar at VAFB and the previously-scheduled launch of the Space Shuttle STS-75 mission from Kennedy Space Center, FL.

SCIENCE BRIEFINGS

The Polar science briefing will be held Tuesday, January 30, at 2 p.m. EST, at the Goddard Space Flight Center, Greenbelt, MD (GSFC), in the Visitor Center on Soil Conservation Rd. Participants will be: Dr. Mario Acuna,

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ISTP/GGS Project Scientist, GSFC; Dr. Robert Hoffman, Deputy Polar Project Scientist, GSFC; Dr. Robert Carovillano, GGS Program Scientist, NASA HQ; Dr. Mary Hudson, Darmouth College, NH; Dr. David Chenette, Lockheed Palo Alto Research Lab, CA; and Joseph Dezio, Project Manager, Global Geospace Project, GSFC.

The NEAR science briefing will be held Tuesday, February 6, at 2 p.m. EST at the NASA Headquarters auditorium, 300 E St., SW, Washington DC (West lobby). Participants will be Dr. John Kerridge, NEAR Program Scientist, NASA HQ; Dr. Andrew Cheng, NEAR Project Scientist, Johns Hopkins University Applied Physics Laboratory (JHU/APL) and other panelists to be announced later.

Both briefings will be carried live on NASA Television via Spacenet 2 Transponder 5, Channel 9, at 69 degrees West longitude. The frequency is at 3880.0 megahertz, audio at 6.8 megahertz. There will be 2-way question and answer capability for reporters covering the briefings from participating NASA Centers.

- end -

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For Release

January 19, 1996

Don Nolan-Proxmire
Headquarters, Washington, DC
(Phone: 202/358-4727)

Mike Mewhinney
Ames Research Center, Mountain View, CA
(Phone: 415/604-9000)

RELEASE: 96-8

MCDONALD NAMED DIRECTOR OF AMES RESEARCH CENTER

Dr. Henry McDonald has been named the new Director of the Ames Research Center, Mountain View, CA, effective March 4, NASA Administrator Daniel S. Goldin announced today.

"Dr. McDonald brings to Ames strong research experience in information systems applications, computational physics and aerodynamics, combined with technical and managerial skills that will reinforce NASA's commitment to aeronautical and space research for a stronger America," Goldin said.

"Information technologies and their applications are key building blocks for all future aeronautics and space endeavors," Goldin continued. "As one of the world's most eminent research facilities, Ames has been selected to become NASA's Center of Excellence for information technology. Under Dr. McDonald's leadership Ames will blaze a new broad trail in information systems technology and continue worldwide leadership in airspace operations and astrobiology," Goldin added.

"McDonald's demonstrated knowledge and experience in research associated with information systems technologies make him a natural as the Director of the Ames Research Center," Goldin said. "He has extensive knowledge of NASA and industry requirements for information technologies, as well as knowledge of the basic research capability of the academic community."

McDonald, formerly the assistant director of computational sciences and professor of mechanical engineering at the Applied Research Laboratory, Pennsylvania State University, earned his bachelor's degree in aeronautical engineering and doctorate in engineering from the University of Glasgow, Scotland.

-more-

Before joining Penn State in 1991, McDonald was founder, president and chief executive officer of Scientific Research Associates, Inc., Glastonbury, CT, where he was also responsible for overall management of the company's computational physics laboratory which specialized in aero-, hydro- and gas dynamics, optical electronics and biomedical research. During this time McDonald was co-inventor of a patented novel ultra-high frequency ventilator which provides life support to critically ill patients suffering from Adult Respiratory Distress Syndrome (ARDS). ARDS is a disease that affects over 300,000 people in the United States each year. McDonald and his co-inventors were awarded the Small Businessman of the Year Award for High Technology by the State of Connecticut for this achievement.

From 1965 to 1976 McDonald worked as a research engineer for United Technologies Research Center, East Hartford, CT, where he investigated problems concerning heat transfer and gas dynamics relative to aircraft engine performance and design.

After graduating from the University of Glasgow, McDonald worked for the British Aircraft Corporation, Warton, England, where he supervised wind tunnel testing, as well as takeoff and landing characteristics of existing and theoretical aircraft designs.

McDonald has authored and reviewed many papers on aeronautical research and development, has been a member of several aeronautical associations and has served on several advisory panels within the aeronautical community. He is an accomplished pilot, having trained in the Royal Air Force Reserve, and sailing enthusiast. McDonald and his wife Dr. June McDonald, M.D., are both naturalized U.S. citizens and have three children.

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News Release

National Aeronautics and
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For Release

Douglas Isbell
Headquarters, Washington, DC
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January 19, 1996

Brian Dunbar
Headquarters, Washington, DC
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RELEASE: 96-9

MISSION TO PLANET EARTH ADMINISTRATOR TO RETURN TO UCLA

Dr. Charles F. Kennel, NASA Associate Administrator for the Office of Mission to Planet Earth, will leave the space agency by late spring to return to the University of California, Los Angeles, NASA Administrator Daniel Goldin announced today.

Kennel has been appointed by the University of California Board of Regents as the new executive vice chancellor and chief academic officer of UCLA. He started work at NASA in January 1994 under a two-year appointment from his post as a professor in the UCLA Department of Physics.

"Under the leadership of Charlie Kennel, the Mission to Planet Earth program has made significant progress in helping improve our understanding of our changing planet," Goldin said. "Dr. Kennel has been instrumental in putting the program on a sound budgetary footing while emphasizing its solid science focus. He has also led development of a coordinated educational program that will help increase students' understanding of Earth's environment."

Key agency accomplishments during Kennel's tenure as associate administrator include the restructuring of NASA's Earth Observing System, increasing usage of advanced technology in the agency's future Earth science missions, the definition of the first steps toward an integrated global observing strategy, and the launch of the first next-generation GOES weather satellite.

"I am extraordinarily grateful to NASA, and especially to Dan Goldin, for giving me the opportunity to work on such a fascinating program, which deals with issues of importance to the whole world," Kennel said. "I've met and worked with some of the most creative and dedicated people I have ever known. It is especially satisfying that I will now be able to apply what I learned from them on behalf of my home institution, UCLA."

-more-

Kennel received an A.B. from Harvard College in 1959 and a Ph.D. in Astrophysical Sciences from Princeton University in 1964. He has been a tenured member of the UCLA Department of Physics since 1967, and was its chairman from 1983 to 1986. He is the author or co-author of more than 225 experimental and theoretical publications in plasma physics, space plasma physics, planetary science, astrophysics, and nonlinear science.

Dr. Kennel has been a Fulbright scholar, a Guggenheim scholar, and a Fairchild Professor at the California Institute of Technology. He is a fellow of the American Geophysical Union, the American Physical Society, the American Association for the Advancement of Science, and a member of the International Academy of Astronautics and the U.S. National Academy of Sciences.

-end-

Video Advisory

National Aeronautics and
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For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

January 21, 1996

VIDEO ADVISORY: V96-3

GALILEO PROBE PRESS CONFERENCE ON MONDAY

On Monday NASA Television will carry a live news briefing, originating from NASA's Ames Research Center, Mountain View, CA, at 1 p.m. EST to review early findings of the Galileo Probe's descent into Jupiter's violent atmosphere. Project scientists and principal investigators will present results from the Probe's six instruments based on their initial looks at the data collected Dec. 7 during their fiery 57-minute descent the Jupiter's upper atmosphere.

In support of Monday's briefing, NTV's video news file will air animation and an interview discussing some of the exciting findings of the Probe.

Video News Files air at noon, 3, 6 and 9 p.m. EST

ITEM #1: PROBE SURPRISE
Atmospheric Probe returns surprising new information about nature and composition of Jupiter, including its water content, clouds, lightening and winds.

ITEM #2: LIGHTENING ON JUPITER
Animation of the location of lightening strikes on Jupiter.

ITEM #3: GALILEO DROPS IN ON JUPITER
Animation from Dec. 1995 depicting the Galileo Probe entering Jupiter's atmosphere.

ITEM #4: GALILEO'S TARGET
Sequence of photos taken by Hubble Space Telescope showing evolution of the Probe's target site on Jupiter.

ITEM #5: INTERVIEW -- DR. RICHARD YOUNG, PROJECT SCIENTIST
Galileo Probe project scientist discusses importance of mission.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

Video Advisory

National Aeronautics and
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David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

For Release

January 22, 1996

VIDEO ADVISORY: V96-4

CHALLENGER B-ROLL, GALILEO PROBE ANIMATION ON NTV

Tuesday's NASA Television video news file will air background footage on the upcoming tenth anniversary of the Space Shuttle Challenger accident. and re-air animation and an interview that supported Monday's Galileo probe press briefing.

Video News Files air at noon, 3, 6 and 9 p.m. EST

ITEM #1: CHALLENGER ANNIVERSARY
Footage from before and after the Space Shuttle Challenger accident.

ITEM #2: PROBE SURPRISE

ITEM #3: GALILEO DROPS IN ON JUPITER

ITEM #4: LIGHTNING ON JUPITER

ITEM #5: ASTEROID IMPACT ON JUPITER

ITEM #6: GALILEO'S TARGET

ITEM #7: INTERVIEW -- DR. RICHARD YOUNG, PROJECT SCIENTIST

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1547)

David Morse
Ames Research Center, Mountain View, CA
(Phone: 415/604-4724)

January 22, 1996
Embargoed until 1 p.m. EST

RELEASE: 96-10

GALILEO PROBE SUGGESTS PLANETARY SCIENCE REAPPRAISAL

Preliminary analysis of early data returned by NASA's historic Galileo probe mission into Jupiter's atmosphere has provided a series of startling discoveries for project scientists.

Information on the extent of water and clouds and on the chemical composition of the Jovian atmosphere is particularly revealing. Probe instruments found the entry region of Jupiter to be drier than anticipated, and they did not detect the three-tiered cloud structure that most researchers had postulated. The amount of helium measured was about one-half of what was expected.

These initial findings are encouraging scientists to rethink their theories of Jupiter's formation and the nature of planetary evolution processes, according to probe project scientist Dr. Richard Young of NASA's Ames Research Center, Mountain View, CA.

"The quality of the Galileo probe data exceeds all of our most optimistic predictions," said Dr. Wesley Huntress, NASA Associate Administrator for Space Science. "It will allow the scientific community to develop valuable new insights into the formation and evolution of our solar system, and the origins of life within it."

The probe made the most difficult planetary atmospheric entry ever attempted, according to probe manager Marcie Smith of NASA Ames. Entering Jupiter's atmosphere on Dec. 7, 1995, it survived entry speeds of over 106,000

-more-

mph, temperatures twice those on the surface of the Sun and deceleration forces up to 230 times the strength of gravity on Earth. It relayed data obtained during its 57-minute descent mission back to the Galileo orbiter more than 130,000 miles overhead for storage and transmission to Earth. The orbiter is now embarking on a two-year mission to study Jupiter and its moons.

"The probe detected extremely strong winds and very intense turbulence during its descent through Jupiter's thick atmosphere. This provides evidence that the energy source driving much of Jupiter's distinctive circulation phenomena is probably heat escaping from the deep interior of the planet," Young said. "The probe also discovered an intense new radiation belt approximately 31,000 miles above Jupiter's cloud tops, and a veritable absence of lightning," he noted.

The composition of Jupiter's atmosphere offered some surprises, according to project scientists. It contains significantly lower than expected levels of helium, neon, and certain heavy elements, such as carbon, oxygen and sulfur.

The issue of the colors of Jupiter's atmosphere has been much-debated, but no consensus has developed from probe data to date. The probe encountered no solid objects or surfaces during its entire 373-mile (600 km) journey. This was as expected for a gas-giant planet such as Jupiter.

What are the implications of these findings? Most scientists believe that Jupiter has a bulk composition similar to that of the gas and dust cloud of the primitive solar nebula from which the planets and our Sun were formed, with added heavy elements from comets and meteorites. The probe's measurements may necessitate a re-evaluation of existing views of how Jupiter evolved from the solar nebula. For example, the lower-than-expected helium and neon levels on Jupiter relative to the Sun influence scientific understanding of the process of fractionation, the "raining out" of helium and neon during planetary evolution.

During the probe's high-speed, atmospheric-entry phase, deceleration measurements high in the atmosphere showed atmospheric density to be much greater than expected. Corresponding temperatures were also much higher than predicted. The high temperatures appear to require an unidentified heating mechanism for this region of the atmosphere.

Following probe parachute deployment, six science instruments on the probe collected data throughout 97 miles (156 km) of the descent. During that time, the probe endured severe winds, periods of intense cold and heat and strong turbulence. The extreme temperatures and pressures of the Jovian environment eventually caused the probe communications subsystem to terminate data transmission operations.

Earth-based telescopic observations suggest that the probe entry site may well have been one of the least cloudy areas on Jupiter. At this location, the probe did not detect the three distinct layers of clouds (a topmost layer of ammonia crystals, a middle layer of ammonium hydrosulfide, and a final, thick layer of water and ice crystals) that researchers had anticipated.

Some indication of a high-level ammonia ice cloud was detected by the net flux radiometer. Evidence for a thin cloud which might be the postulated ammonium hydrosulfide cloud was provided by the nephelometer experiment. There was no data to suggest the presence of water clouds of any significance. The vertical temperature gradient obtained by the atmospheric structure instrument was characteristic of a dry atmosphere, free of condensation. Only the one, distinctive cloud structure was identified, and that was of modest proportion.

The latest analyses of data from the Voyager spacecraft that flew by Jupiter in 1979 have suggested a water abundance for the planet of twice the solar level (based on the Sun's oxygen content). Observations of the propagation of atmospheric waves across Jupiter's cloud tops from the Comet Shoemaker-Levy 9 impacts implied that Jupiter might have a water content of ten times the solar level. Actual probe measurements, while subject to scientific debate, suggest a level near that of the Sun. Scientists are left to wonder, "where is the oxygen?," "where is the water?," and to reconsider their interpretation of the S-L 9 impacts.

Scientists had expected to find severe winds on Jupiter ranging up to 220 mph. However, the probe appears to have detected winds far greater, perhaps up to 330 mph. The winds remained fairly constant as the probe descended deep into the Jovian atmosphere. This suggests that Jupiter's winds are not caused by differential sunlight at the equator versus the poles or by heat released by water condensation as on Earth, according to project scientists.

"The origin of Jupiter's winds appears to be the internal heat source which radiates energy up into the atmosphere from the planet's deep interior," Young said. "This impacts Jupiter's climate and circulation patterns, and suggests a jet stream-like mechanism rather than swirling hurricane or tornado-like storms."

The probe found that lightning occurs on Jupiter only about one-tenth as often as on Earth. This is puzzling, but consistent with the absence of water clouds. A virtual absence of lightning reduces the probability of finding complex organic molecules in Jupiter's atmosphere, particularly given its hostile, predominantly hydrogen composition.

-more-

Scientists caution that results obtained to date, while dramatic and exciting, are only preliminary and subject to much further analysis and refinement. Data transmission problems associated with solar conjunction between the Earth and Jupiter, the need to refine estimates based on probe and orbiter trajectories, the presence of higher than anticipated instrument temperatures, and the need for improved calibration all require a cautious approach to these early findings.

Additional information will be forthcoming over the next few months as scientists continue to evaluate the wealth of data obtained by the probe and to cross-compare results of individual scientific instruments. Further information and images about the Galileo mission to Jupiter can be accessed on the Internet through the following three URLs:

http://ccf.arc.nasa.gov/dx
http://ccf.arc.nasa.gov/galileo_probe/
http://www.jpl.nasa.gov/galileo

The Galileo probe project is managed by NASA's Ames Research Center, Mountain View, CA. Hughes Aircraft Co., El Segundo, CA, designed and built the probe; General Electric, Philadelphia, PA, built the probe's heat shield. NASA's Jet Propulsion Laboratory, Pasadena, CA, built the Galileo orbiter spacecraft and manages the overall mission.

-end-

Video Advisory

National Aeronautics and
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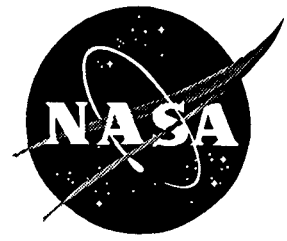

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

January 23, 1996

VIDEO ADVISORY: V96-5

TRAJECTORY TOOL SOFTWARE, BEETLE MANIA ON NTV

Wednesday's NASA Television video news file will feature pieces on how NASA designed three-dimensional software developed at NASA's Ames Research Center, Mountain View, CA, models spacecraft trajectories to help calculate a spacecraft's location in space. Also airing will be footage and interviews showing how NASA's Stennis Space Center, MS, remote sensing airborne technology is being used in Louisiana to help combat pine beetle infestation in forests. NASA TV will reair background footage on the upcoming tenth anniversary of the Space Shuttle Challenger accident at the close of Wednesday's news file.

Video News Files air at noon, 3, 6 and 9 p.m. EST

ITEM #1: SPACECRAFT LOCATOR
"TrajTool" software models trajectories of spacecraft to help plot their location.
ITEM #2: INTERVIEW -- DR. URSULA SCHWUTTKE
Software development manager discusses value of new software.
ITEM #3: INTERVIEW -- ALAN QUAN
Technical group leader discusses new software.
ITEM #1: BEETLE MANIA
NASA airborne remote sensing observations detect beetle infestation in Louisiana forests.
ITEM #5: DR. GREG CARTER, EARTH OBSERVATION RESEARCH OFFICE
Stenis researcher discusses remote sensing applications for forestry.
ITEM #6: MICHAEL SEAL, SPACE REMOTE SENSING CENTER
Researcher discusses remote sensing and beetle research.
ITEM #7: KIRK CASANOVA, LOUISIANA OFFICE OF FORESTRY
Casanova reviews NASA/forestry beetle research project.
ITEM #8: REPLAY -- CHALLENGER ANNIVERSARY BACKGROUND FOOTAGE

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release
January 23, 1996

Brian Welch
Headquarters, Washington, DC
(Phone: 202/358-1600)

Jeffrey Carr
Johnson Space Center, Houston, TX
(Phone: 713/483-3671)

RELEASE: 96-11

ABBEY NAMED DIRECTOR OF JOHNSON SPACE CENTER

George W. S. Abbey has been named the new Director of the Lyndon B. Johnson Space Center (JSC), Houston, TX, effective immediately, NASA Administrator Daniel S. Goldin announced today.

"George Abbey is uniquely qualified to lead the Johnson team into the future," Goldin said. "Over the course of his eminent career with NASA, he has distinguished himself as an innovator and pioneer at all levels of Agency management."

Abbey had been serving as acting Director at JSC since August 1995. His career in federal service spans over 40 years. His career with NASA began in 1967.

Abbey earned his bachelor's degree in general science at the U.S. Naval Academy and a master's degree in electrical engineering from the Air Force Institute of Technology. As a pilot in the Air Force, Abbey was assigned to various Air Force Commands and has over 4,500 hours in jet, reciprocating engine, and rotary wing aircraft.

During his Air Force career, Abbey served in a variety of technical and management assignments on the Air Force's Dyna-Soar program, as a technical liaison officer to the Boeing Company, and with NASA's Langley Research Center, Hampton, VA, on the Lunar Orbiter Program.

After being detailed to the newly-opened Manned Spacecraft Center (now JSC) in 1964, Abbey resigned from the Air Force and joined the center's NASA staff in 1967 as Technical Assistant to the Manager, Apollo Spacecraft Program. He was assigned as Technical Assistant to the center director in 1969.

-more-

From January 1976 to March 1985, Abbey served as Director of Flight Operations, responsible for operational planning as well as overall direction and management of flight crew and flight control activities for all human space flight missions. In March, 1985, he became the Director of the newly-formed Flight Crew Operations organization responsible for the selection, management and direction of flight crews as well as center aircraft operations.

Abbey was appointed Deputy Associate Administrator for Space Flight at NASA Headquarters in March 1988. Beginning in July, 1990, he served as Deputy for Operations and senior NASA representative to the Synthesis Group chaired by Lt. Gen. Thomas P. Stafford, USAF (ret.), and charged with defining strategies for returning to the Moon and landing on Mars.

In July 1991, Abbey was appointed Senior Director for Civil Space Policy for the National Space Council, Executive Office of the President. He served in this capacity until appointed Special Assistant to the Administrator of NASA in April 1992.

He was named Deputy Director of JSC in January1994.

Among his numerous awards and honors are the NASA Exceptional Service Medal and two NASA Distinguished Service Medals.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

Beth Schmid
Headquarters, Washington, DC
(Phone: 202/358-1760)

January 23, 1996

RELEASE: 96-12

NASA OMBUDSMAN PROGRAM TO FACILITATE PROCUREMENT PROCESS

A new NASA Ombudsman Program has been created to address the procurement concerns of NASA contractors before they become problems.

The idea for this program was conceived when NASA Administrator Daniel S. Goldin made a commitment to NASA contractors to establish a program to improve communication between government and industry. The intent is to provide offerors, potential offerors and contractors with a single point of contact to address their concerns if issues arise.

An Agency-wide ombudsman and Center ombudsmen have been designated and are available to facilitate the procurement process. The names and phone numbers for each Center ombudsman are listed below.

NASA OMBUDSMEN FOR ACQUISITION

CENTER	NAME	PHONE NO.
Agency-wide	Tom Luedtke	202/358-3082
Ames Research Center	Jana Coleman	415/604-5354
Dryden Flight Research Center	Kevin Petersen	805/258-3103
Goddard Space Flight Center	Vernon Meyers	301/286-5066
Johnson Space Center	Susan Garman	713/483-0490
Jet Propulsion Lab.	Kurt Lindstrom	818/354-5359
Kennedy Space Center	James Thomas	407/867-2355
Langley Research Center	Belinda Adams	804/864-8989
Lewis Research Center	Julian Earls	216/433-3014
Marshall Space Flight Center	H. W. Hallisey	205/544-0092
Stennis Space Center	Mark Craig	601/688-2123
Space Station Ofc.	William Shepherd	713-244-8249
Headquarters	Michael Christensen	202/358-2100

-end-

Video Advisory

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

For Release

January 24, 1996

VIDEO ADVISORY: V96-6

DELTA CLIPPER TANK TEST ON NASA TV THURSDAY

Thursday's NASA Television video news file will feature pieces on December's successful testing of a lightweight composite hydrogen fuel tank that will be used on NASA's DC-XA "Delta Clipper" experimental launch vehicle. The DC-XA is a pyramid-shaped rocket designed to fly into space, and then re-enter Earth's atmosphere and land vertically. The DC-XA is part of NASA's commitment to developing next-generation reusable launch vehicles to provide America with faster, better, cheaper access to space. NASA TV also will replay features from Wednesday on new computer software used for tracking spacecraft and features on remote sensing technology used to combat beetle infestation in Louisiana.

Video News Files air at noon, 3, 6 and 9 p.m. EST

ITEM #1: HYDROGEN TANK TEST
New lightweight composite hydrogen tank for the DC-XA successfully completed tests at NASA's Marshall Space Flight Center, Huntsville, AL.

ITEM #2: INTERVIEW -- DAN DUMBACHER, DC-XA PROJECT MANAGER
Dumbacher explains the significance of the hydrogen tank tests.

ITEM #3: REPLAY -- SPACECRAFT LOCATOR
ITEM #4: REPLAY -- INTERVIEW -- DR. URSULA SCHWUTTKE
ITEM #5: REPLAY -- INTERVIEW -- ALAN QUAN
ITEM #6: REPLAY -- BEETLE MANIA
ITEM #7: REPLAY -- DR. GREG CARTER
ITEM #8: REPLAY -- MICHAEL SEAL, SPACE REMOTE SENSING CENTER
ITEM #9: REPLAY -- KIRK CASANOVA, LOUISIANA OFFICE OF FORESTRY
ITEM #10: REPLAY -- CHALLENGER ANNIVERSARY BACKGROUND FOOTAGE

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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Video Advisory

National Aeronautics and
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David E. Steitz
Headquarters, Washington, DC
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For Release

January 25, 1996

VIDEO ADVISORY: V96-7

DELTA CLIPPER TANK TEST ON NASA TV FRIDAY

Friday's NASA Television video news file will replay feature pieces on December's successful testing of a lightweight composite hydrogen fuel tank that will be used on NASA's DC-XA "Delta Clipper" experimental launch vehicle. The DC-XA is a pyramid-shaped rocket designed to fly into space, and then re-enter Earth's atmosphere and land vertically. The DC-XA is part of NASA's commitment to developing next-generation reusable launch vehicles to provide America with faster, better, cheaper access to space.

Video News Files air at noon, 3, 6 and 9 p.m. EST

ITEM #1: HYDROGEN TANK TEST

New lightweight composite hydrogen tank for the DC-XA successfully completed tests at NASA's Marshall Space Flight Center, Huntsville, AL.

ITEM #2: INTERVIEW -- DAN DUMBACHER, DC-XA PROJECT MANAGER

Dumbacher explains the significance of the hydrogen tank tests.

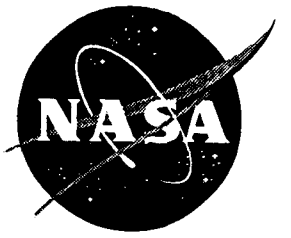
NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600



Jim Cast
Headquarters, Washington, DC
(Phone: 202/358-1779)

Dom Amatore
Marshall Space Flight Center, Huntsville, AL
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For Release

January 25, 1996

RELEASE: 96-13

COMPOSITE HYDROGEN TANK TEST COMPLETED FOR DC-XA

A new lightweight composite hydrogen tank for the Delta Clipper-Experimental Advanced (DC-XA) vehicle, an unpiloted, single-stage rocket being developed by NASA and McDonnell Douglas Aerospace, has successfully completed testing at the Marshall Space Flight Center, Huntsville, AL.

"This is really quite a breakthrough," said NASA's DC-XA project manager Dan Dumbacher. "This is the largest composite hydrogen tank ever to successfully survive flight operating conditions. It demonstrates that composite tanks can be used for other reusable launch vehicles in the future."

Permeability of composite materials has been a concern for engineers, but this tank withstood pressure testing at cryogenic temperatures that simulated the DC-XA flight environment without leaking hydrogen. Composite materials are formed by blending epoxies and various filaments to form strong structures with a variety of aerospace uses. NASA has been conducting intensive research and development on composites since the 1970s.

The DC-XA is a flying experimental testbed that is demonstrating technologies for NASA's Reusable Launch Vehicle Program. Knowledge gained in developing and test flying the DC-XA will be used in development of the X-33 advanced technology demonstrator and ultimately in a full-scale reusable launch vehicle.

The ability to use composites is important to the development of a single-stage-to-orbit reusable launch vehicle because of the weight reduction they provide. Getting the weight down is a key factor in launching a payload to orbit in a single stage rocket. DC-XA's 16-foot-tall hydrogen tank, eight feet in diameter, is made of graphite composites and weighs 2,020 pounds -- 1,200 pounds lighter than the tank used in its predecessor, the DC-X. Yet the composite tank provides the same strength that an aluminum tank would.

-more-

The successful on-time completion of this test is a big step forward for the DC-XA, Dumbacher said.

"It's a major milestone in the DC-XA program," Dumbacher said . "It keeps us on track to flight test the vehicle in May. We've shipped the tank to McDonnell Douglas Aerospace in Huntington Beach, CA, where they will build the flight vehicle around it."

"This will be the first graphite epoxy cryogenic fuel tank to undergo flight testing," said Dave Schweikle, McDonnell Douglas DC-XA program manager. "The tank was designed and fabricated by McDonnell Douglas to hold liquid hydrogen at minus 423 degrees Fahrenheit and to serve as an integral part of the DC-XA's structure."

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

January 26, 1996

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NOTE TO EDITORS: N96-4

LAUNCH OF NEAR ON SCHEDULE, POLAR LAUNCH RETARGETED; POLAR SCIENCE BRIEFING RESCHEDULED

With all prelaunch preparations proceeding smoothly, managers have decided that the Near Earth Asteroid Rendezvous (NEAR) mission, will be NASA's next expendable vehicle launch. Liftoff is scheduled for Feb. 16 from Pad B at Launch Complex 17, Cape Canaveral Air Station, FL. The launch window extends from 3:53:07 p.m. to 3:54:07 p.m. EST, a duration of one minute.

Launch of NASA's Polar spacecraft, to occur from NASA's Space Launch Complex 2 at Vandenberg Air Force Base, CA (VAFB), has been retargeted to Feb. 22. The launch window extends from 3:22 a.m. to 3:47 a.m. PST, a duration of 25 minutes. Activities to prepare for the Polar launch also have been going well and the spacecraft was erected atop the McDonnell Douglas Delta II rocket on Tuesday, Jan. 23.

The Polar Science Briefing has been rescheduled to Friday, Feb. 9, at 2 p.m. EST, at the Goddard Space Flight Center, Greenbelt, MD (GSFC), Visitor Center on Soil Conservation Rd. Participants will be: Dr. Mario Acuna, ISTP/GGS Project Scientist, GSFC; Dr. Robert Hoffman, Deputy Polar Project Scientist, GSFC; Dr. Robert Carovillano, GGS Program Scientist, NASA HQ; Dr. Mary Hudson, Dartmouth College, NH; Dr. David Chenette, Lockheed Palo Alto Research Lab, CA; and Joseph Dezio, Project Manager, Global Geospace Project, GSFC.

-more-

The NEAR Science briefing will be held as previously scheduled on Tuesday, Feb. 6, at 2 p.m. EST at the NASA Headquarters auditorium, 300 E St., SW, Washington DC (West lobby). Participants will be Andrew Cheng, NEAR Project Scientist, Johns Hopkins University Applied Physics Laboratory (JHU/APL); Robert W. Farquhar, NEAR Mission Manager, JHU/APL; Joseph Ververka, Cornell University, Ithaca, NY; Jacob I. Trombka, NASA/GSFC; Maria T. Zuber, MIT, Cambridge, MA, and NASA/GSFC.

Both briefings will be carried live on NASA Television via Spacenet 2 Transponder 5, Channel 9, at 69 degrees West longitude. The frequency is at 3880.0 megahertz, audio at 6.8 megahertz. There will be 2-way question and answer capability for reporters covering the briefings from participating NASA Centers.

- end -

Video Advisory

National Aeronautics and
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Washington, DC 20546
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For Release

David E. Steitz
Headquarters, Washington, DC
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January 29, 1996

VIDEO ADVISORY: V96-8

INTERNATIONAL SPACE STATION FEATURED ON NTV TUESDAY

On Tuesday NASA Television will air footage and animation reviewing the progress of the international Space Station. The first element of the Station is due to be launched into orbit in 1997, with the Station becoming permanently human-tended in the year 2000.

Video News Files air at noon, 3, 6 and 9 p.m. EST

ITEM #1: ANIMATION OF INTERNATIONAL SPACE STATION

Three animation segments include full fly-around of the Station, views of various components, and a view of the entire assembly orbiting the Earth.

ITEM #2: NEW HABITATION MODULE AND NODE

Construction of the node and habitat sections of the Station.

ITEM #3: INTERNATIONAL SPACE STATION HARDWARE

Boeing manufacturing facility in Huntsville, AL, has produced hardware for the international Space Station.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

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January 29, 1996

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RELEASE: 96-14

NASA SELECTS PAYLOAD SPECIALISTS FOR SHUTTLE MISSION

Dr. Roger K. Crouch and Dr. Gregory T. Linteris have been selected to fly as payload specialists on the 1997 Microgravity Science Laboratory mission.

Crouch earned a Ph.D. in physics from Virginia Polytechnic Institute and State University, Blacksburg, VA. He is the lead microgravity scientist in NASA's Office of Life and Microgravity Sciences and Applications, Washington, DC. The 55-year-old Crouch was an alternate payload specialist for STS-42, the first International Microgravity Laboratory mission. He resides in Laurel, MD.

Linteris, 38, earned a Ph.D. in mechanical and aerospace engineering from Princeton University, Princeton, NJ. He is a mechanical engineer at the National Institute of Standards and Technology, Gaithersburg, MD, where he is responsible for developing a research program on advanced fire suppressants. Linteris lives in Great Falls, VA.

NASA has designated Dr. Paul D. Ronney of the University of Southern California to serve as a backup, or alternate, to Crouch and Linteris. As an alternate, Ronney will undergo the same training as Crouch and Linteris and will be ready to serve on the flight crew if necessary. Ronney is a resident of Monrovia, CA.

The 16-day Spacelab mission is scheduled for flight aboard the Space Shuttle Columbia on the STS-83 mission in the spring of 1997. Crouch and Linteris will conduct more than 25 investigations in microgravity sciences, such as fluid physics, combustion science and materials science. Ronney will serve in a key mission position as crew interface coordinator in the Spacelab Mission Operations Control Center at the Marshall Space Flight Center, Huntsville, AL.

-end-

News Release

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For Release

Brian Welch
Headquarters, Washington, DC
(Phone: 202/358-1600)

January 30, 1996

RELEASE: 96-15

WEST NAMED NASA CHIEF INFORMATION OFFICER

Ronald S. West has been named Chief Information Officer (CIO) at NASA Headquarters, Washington, DC, effective March 3, 1996. West will succeed John C. Lynn, who has announced his intention to retire after 40 years of government service.

The CIO reports directly to the NASA Administrator and is responsible as an integrated Agency focus for the development of information resource management strategies, policies, and practices. These encompass strategic planning; standards in computing, networking, and security; establishment of system and information architectures; and incorporation of life-cycle management concepts into information technology acquisitions and management. In addition, the CIO serves as the NASA-designated Senior Official for Information Resource Management.

Over the past two years, West has performed dual assignments in support of the CIO and Manager of the Headquarters Consolidated Information Resources and Management Support contract. For the CIO, he has managed the definition, coordination, and development of common standards for the establishment of a NASA-wide Information Technology Architecture -- a major information management re-engineering initiative.

From 1990 to 1994, West was Manager, Technical and Management Systems Office, within the Space Station Freedom Program Office. In that position, West was responsible for the development and integration of the Technical Management Information System within the Space Station Freedom Program.

From 1986 to 1990, West was Manager, Data Integration Office of the National Space Transportation System Engineering Integration Office at the Johnson Space Center, Houston, TX. In that position, he managed system engineering activity for flight hardware configuration and maintenance accounting; activities required to establish formal agreements between NASA Headquarters, NASA center organizations, and prime contractors on Shuttle flight parameters; and the development of the Program Compliance Assurance Status System that brings together engineering, safety and configuration management data to support Certificate of Flight Readiness reviews for the Space Shuttle.

-more-

From 1983 to 1986, West served as Senior Systems Engineer for Shuttle Mission Reconfiguration and Mass Property Analysis. From 1980 to 1983, he served as Senior Systems Engineer for all Shuttle master measurement database software development, data management and product deliverables.

Prior to his employment with NASA, he worked for Lockheed Electronics and TRW Systems, Inc., as a project manager for Computer System Development, Shuttle Program Information Management System Development and verification, integration, and publication of Apollo, Skylab and Apollo-Soyuz test program mass property, weight, and consumable data.

West received a Bachelor of Science degree in mathematics in 1965 from the University of Houston.

-end-

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

January 29, 1996

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RELEASE: 96-16

KEY COMPONENTS INSTALLED ON SATURN-BOUND SPACECRAFT

Computer brains, an electronic inner ear and the spacecraft equivalent of a cardiovascular system have been successfully installed into NASA's Cassini spacecraft bound for a launch to Saturn in 1997.

Engineers and technicians at the Jet Propulsion Laboratory (JPL), Pasadena, CA, this month completed installation of this key flight hardware on the Cassini spacecraft framework in JPL's spacecraft assembly facility clean room.

Also included among many critical Cassini milestones met this month was a successful 200-minute engine firing of the spacecraft's main rocket engine last week, and successful completion of launch-like vibration testing for Cassini's Huygens probe. This conical payload of science instruments, provided by the European Space Agency (ESA), will be deployed from the orbiter and parachute to the surface of Saturn's moon Titan, in a manner similar to the recent successful mission of the Galileo atmospheric probe into Jupiter.

"The Cassini team has done an excellent job of keeping the program on track to complete the orbiter and probe on schedule and within budget," said Richard J. Spehalski, Cassini program manager at JPL, which manages the effort for NASA. "Our challenge in 1996 will be to maintain our momentum as all the spacecraft elements come together."

Last week, Cassini's attitude and articulation control subsystem (AACS) was integrated. The AACS allows the spacecraft to maintain its bearings in space. It joined the already-installed power and pyro subsystem, which governs the flow of electricity through seven miles of cable that will link all of Cassini's systems, and the command and data subsystem, which acts essentially as Cassini's brain, controlling all spacecraft functions.

While Cassini engineers and technicians assemble the spacecraft in the clean room, engineers and technicians in an adjacent shirtsleeve environment are remotely controlling the new subsystems in tests that run each through the commands and phenomena they will experience in flight.

-more-

This complex computer-based ground system largely resembles the one that will be used to control Cassini once in flight, and it allows the Cassini team to identify problems and make changes needed in the flight operations system well ahead of launch.

Last week also marked the successful completion of a critical 200-minute test firing of one of the two spacecraft rocket engines, demonstrating the capability of the main engine assembly including the successful operation of JPL-developed engine gimbal actuators -- sophisticated devices that fine-tune the motion and pointing of the spacecraft's two engines.

The engine gimbal actuators, based upon the design of unique actuators used on the orbiter spacecraft for the Viking missions to Mars in the mid-1970s, come into play during spacecraft course corrections and in the critical braking maneuver that Cassini must perform when it arrives at Saturn in July 2004.

There, Cassini must fire one of its engines for about 90 minutes to brake into orbit around the ringed planet. The two redundant engines are mounted side-by-side at the base of the Saturn orbiter, and the engine that fires must be pointed so that the rocket thrust is directed through the spacecraft's center of gravity. The engine gimbal actuators, responding to commands from the attitude and articulation control subsystem, will make constant minute adjustments in the engine's position to compensate for the shifting weight of more than 6,800 pounds (3,100 kilograms) of propellant.

Important tests of Cassini's multiple-frequency radio system were also successfully completed this month at JPL. In addition, ESA, assembling the Huygens probe in Otterbrun, Germany, received hardware for U.S.-provided Titan science instruments -- a qualification model of the gas chromatograph/mass spectrometer from NASA's Goddard Space Flight Center, Greenbelt, MD, and the flight model of the descent imager/spectral radiometer from the University of Arizona.

Integration of Cassini components will continue through October this year, readying the spacecraft for dynamic and other testing in the space-like environment of the solar-thermal vacuum chamber at JPL. The spacecraft will be shipped to Cape Canaveral, FL, in late April 1997 for an October 1997 launch.

Cassini is a joint mission of NASA, ESA and the Italian Space Agency (ASI). The main Cassini spacecraft will orbit Saturn to provide four years of close-up data on the moons, rings, planet and Saturn's magnetic and charged particle environment. The Huygens Titan probe is provided by ESA, and Cassini's sophisticated radio antenna is provided by ASI. JPL manages the overall mission for NASA.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

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January 30, 1996

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RELEASE: 96-17

EXTERIOR OF U.S. SPACE STATION MODULES COMPLETED; FLIGHT HARDWARE ON TRACK FOR LAUNCH IN 1997

With a final weld on the module that will house astronauts aboard the international Space Station, over 80,000 pounds of flight hardware have been manufactured and the exterior structures of the U.S. components are now complete.

"Our manufacturing is proceeding on schedule," said Wil Trafton, acting Associate Administrator for Space Flight. "This is what two years of stable funding and hard work will get you. Node 1 will be launched in December 1997 and we are right on track with our other modules. We'll be ready for the first U.S. launch."

McDonnell Douglas technicians are installing secondary structural subassemblies in both Node 1 and Node 2. This equipment includes braces that will hold floors, equipment racks and parts of various station utility systems, life support, power, communication and other elements.

Boeing completed machining on Nodes 1 and 2 last year. The nodes also have all of their hatches and common berthing mechanisms in place. Node 2 (which serves as both the structural test article and a flight article) is almost ready to begin pressure and leak testing. To that end, technicians have attached approximately 900 strain gauges to measure stresses during a series of tests which begin later this month. It will be painted after these tests are complete. Node 2 is scheduled to be launched to the Space Station in September 1999.

Node 1, which will be the first U.S.-manufactured Space Station module to fly, also has been welded and machined. It will be painted in April and will undergo pressure tests after Node 2. In June, Node 1 will begin the process of final assembly and checkout. It will be launched from Kennedy Space Center in November 1997.

-more-

The U.S. lab module currently is being machined in a device called a horizontal boring mill. Technicians will begin installing mechanical systems in early February. The lab then will undergo its own pressure tests and be painted. The laboratory module will come back to a clean room for checkout before being shipped to Kennedy Space Center for its scheduled November 1998 launch.

The U.S. habitat module, where the astronauts will eat and sleep, will follow the lab module into the horizontal boring mill for machining, then undergo mechanical installation in May and begin pressure tests in July. The habitat module is among the last pieces to be launched to the International Space Station in 2002. The laboratory and habitat modules each are 28 feet long and 14 feet in diameter. The two connecting node modules are the same diameter, but 10 feet shorter.

Boeing also is building an airlock module for the Space Station. Astronauts will suit up in the airlock before venturing out during spacewalks. Welding on the airlock has begun and will be completed in June. Once the airlock is built, it will mark the completion of welding of every major structural component being built by Boeing in Huntsville.

NASA's international partners also are making progress on their hardware. The critical Russian-built Functional Cargo Block (FGB) is on schedule for launch on a Proton vehicle in November 1997. In December, 1995, the FGB experienced a pressure test failure. Khrunichev, the Russian subcontractor building the FGB, had seen this anomaly in prior modules similar to the FGB. Recently, Khrunichev completed repairs and carried out the pressure test successfully. The FGB is back on schedule.

-end-

EDITOR'S NOTE: Images to illustrate this release are available for news media representatives by calling the Headquarters Broadcast and Imaging Branch on 202/358-1900. Photo numbers are:

Caption description	Color	B&W
Habitation Module	96-HC-36	96-H-36
Laboratory Module	96-HC-37	96-H-37
Node Modules	96-HC-38	96-H-38

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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Ray Castillo
Headquarters, Washington, DC
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For Release
January 30, 1996

RELEASE: 96-18

NASA AND RSA AGREE TO EXTEND SHUTTLE-MIR ACTIVITIES

Expanding on the success of the Shuttle-Mir program, NASA and the Russian Space Agency have agreed in principle to extend Shuttle-Mir activities into 1998.

NASA will add two missions to Mir, bringing the total number of planned Shuttle-to-Mir docking missions to nine, while Russia will meet its commitment to deliver on schedule key elements used in the early assembly of the international Space Station.

STS-90, which had not been previously designated as a Mir mission, will now dock with the Russian station. A second mission, a new flight to Mir, was added to the Shuttle manifest. Both will occur in 1998.

It was also announced today that U.S. astronaut William M. Shepherd and Russian cosmonaut Sergei K. Krikalev will be on the first team of crew members to occupy the international Space Station. A three person crew will be able to live and work on the Space Station beginning in May 1998. They will be launched to the Space Station aboard a Soyuz rocket from the Baikonur launch site in Kazakhstan.

The additional flights to Mir and the selection of the two crew members were announced in a press conference today by Vice President Albert Gore and Russian Prime Minister Victor Chernomyrdin at the conclusion of their two-day meeting.

"The Shuttle-Mir program is already paying back benefits," said NASA Administrator Daniel S. Goldin. "We are laying the foundation for construction of the international Space Station with these docking flights," he said. "Mir is proving to be an ideal test site for vital engineering research and expanding our knowledge of the effects of long-duration weightlessness on people," said Goldin.

Goldin said the two docking flights completed thus far have proved to be enormously beneficial. "We have simulated an early construction flight and conducted proximity and docking operations," said Goldin. He added that the agreement enables the Russians to use the Space Shuttle to help them with a significant logistics shortfall. Goldin said NASA would study the extension of the Phase One program into 1999.

-more-

Russia will meets its commitments, deliver the Functional Cargo Block (FGB) for a November 1997 launch, and deliver the Service Module in 1998.

The details of these arrangements, including the technical and financial aspects, will be worked out in subsequent NASA/RSA negotiations beginning in March. Under this arrangement, the following would occur:

- The jointly-developed Science Power Platform would be launched to the Space Station on the Space Shuttle. The Power Platform includes solar arrays to power experiments in the Russian research modules, and attitude control equipment.

- Russia would modify the Soyuz space capsules to accommodate a larger percentage of the U.S. astronaut corps. The Soyuz will serve as the emergency return vehicle for crew members living and working aboard the Space Station through the end of construction in June 2002 when a new NASA-developed vehicle becomes available. Size restrictions of the Soyuz capsules currently would prevent nearly half of the U.S. astronaut corps from being eligible for tours on the Station.

- Russia would increase the payload-carrying capability of the Progress resupply craft by 440 pounds, and would develop a new resupply vehicle, called the FGB cargo vehicle, which would haul station-keeping propellant to the Space Station.

- As part of the Phase One extension, NASA would have opportunities for additional NASA astronauts to perform long-duration missions on Mir.

-end-

News Release

National Aeronautics and
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For Release

January 31, 1996

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NOTE TO EDITORS: N96-5

ASTRONAUTS PARTICIPATE IN MIR 21 CREW PRESS BRIEFING AT STAR CITY, RUSSIA ON FEB. 6

NASA astronauts Shannon W. Lucid, Ph.D., and John E. Blaha (Colonel, USAF, Ret.), currently training in Russia for the Mir 21 mission, will participate in a crew press conference at the Y.A. Gagarin Cosmonaut Training Center, Star City, Russia, on Tuesday, Feb. 6, at 8 a.m. EST (4 p.m. Moscow time).

U.S. news media wishing to obtain press accreditation to cover this event in Star City should contact Debra Rahn, Public Affairs Officer, International Relations, NASA Headquarters, by phone at 202/358-1639 or by fax at 202/358-2983.

Lucid and Blaha were selected last year as the prime and backup crew members for a five-month flight on the Russian space station Mir in 1996 and have been training in Star City since March 1995.

Lucid is scheduled to be launched to Mir on the Space Shuttle Atlantis as part of the STS-76 crew on March 21. Lucid will join the two Russian Cosmonauts, Mir 21 Commander Yuri Onufrienko and Flight Engineer, Yuri Usachev, who are scheduled to be launched to the Mir on Feb. 21. While the Space Shuttle Atlantis is docked to Mir for five days, two U.S. astronauts will conduct a spacewalk to attach a series of experiments to the Mir docking module. Atlantis will be carrying logistical supplies and water to be transferred to the Mir.

-end-

EDITOR'S NOTE: NASA will carry the Mir 21 crew press conference live on NASA Television starting at 8:00 a.m. EST (4:00 p.m. local Moscow time). Due to the limited time set aside for the press conference, two-way Q&A capability from the United States will not be provided.

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

January 31, 1996

VIDEO ADVISORY: V96-10

ONLINE PHOTO ARCHIVE, NEW X-RAY DEVICE ON NASA TV

Thursday's video news file will air features on NASA's Planetary Photojournal, accessible on the Internet via the World Wide Web, that enables access to NASA's archive of planetary images for viewing and use by the public, scientists, educators and publishers. The images of the planets, produced by the U.S. space program, go on-line in a central location Thursday as part of a joint project of NASA and the U.S. Geological Survey. NASA TV will then replay footageof a new X-Ray imaging system that is 100 times more powerful than any existing commercial X-Ray source. The system offers new opportunities for scientific, industrial and medical research. Also replayed Thursday will be a feature on the 50th Anniversary of NASA's Dryden Flight Research Center, one of the premier flight research centers in the world. *Video News Files air at noon, 3, 6 and 9 p.m. EST*

ITEM #1: NEW ONLINE PHOTO ARCHIVE AVAILABLE VIA INTERNET
New Planetary photo archive goes online via the Internet Thursday.

ITEM #2: INTERVIEW -MYCHE MCAULEY, PLANETARY DATA SYSTEMS
JPL employee discusses new photo archive.

ITEM #3: INTENSE X-RAY

ITEM #4: INTERVIEW -- DANIEL CARTER, NASA RESEARCH SCIENTIST

ITEM #5: INTERVIEW -- DAVID GIBSON, X-RAY OPTICAL SYSTEM, INC.

ITEM #6: INTERVIEW -- WALTER GIBSON, PHYSICS PROFESSOR

ITEM #7: NASA DRYDEN TURNS 50

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-end-

Note: The URLs for the new Planetary Photojournal Archives are:
http://www-pdsimage.jpl.nasa.gov/PIA (at JPL)
http://pdsimage.wr.usgs.gov/PIA (at the USGS.)

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National Aeronautics and
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Washington, DC 20546
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For Release

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

January 31, 1996

Steve Roy
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

RELEASE: 96-19

NASA HELPS INVENT REVOLUTIONARY X-RAY INSTRUMENT

A three-year collaborative effort by NASA, industry and university researchers has resulted in the development of an instrument which can generate the world's most intense source of commercial X-rays.

Capable of generating beams that are more than 100 times the intensity of other conventional X-ray sources, the new instrument is expected to lead to improvements in biotechnology research and have a wide variety of applications in scientific research, medicine and industry.

The revolutionary invention was developed by researchers at NASA's Marshall Space Flight Center, Huntsville, AL; X-Ray Optical Systems, Inc., Albany, NY; and the Center for X-Ray Optics of the State University of New York at Albany.

"This new optical instrument provides something never before possible: a capability to control the direction of X-ray beams," explained Dr. Walter Gibson, Professor of Physics at the State University of New York at Albany.

At the heart of the instrument is a new type of optics for X-rays called "Capillary Optics."

"The X-rays are controlled by reflecting them through tens of thousands of tiny curved channels or capillaries, similar to the way that light is directed through fiber optics," said Gibson. "Thus, we are able to concentrate the beams to suit the particular needs of the intended research or medical procedure."

-more-

Researchers at Marshall are using the newly developed X-ray instrument to determine the atomic structure of important proteins which are the targets for drug design by leading pharmaceutical companies. "Our current research efforts focus on many difficult public health problems such as cancer, AIDS and heart disease," said Dr. Daniel Carter of Marshall's Laboratory for Structural Biology.

"This new capillary X-ray technology will allow us to pursue more challenging research problems in our own laboratory with a speed and effectiveness never before possible," said Carter. "These and future applications should have a profound impact on many areas of science and medicine.

"We expect this new technology to significantly accelerate the ability of researchers to gather the information necessary to design entire families of highly effective, disease-fighting drugs," said Carter.

The new X-ray lens system, designed by the University of New York at Albany under NASA contract, incorporates the special optics manufactured by X-Ray Optical Systems.

"As a result of working with NASA and the State University of New York at Albany, we have developed X-ray optics which will provide important commercial benefits to a broad range of industries," said David Gibson, president of X-Ray Optics. "Many commercial applications of this new technology are possible, including better manufacturing control for semiconductor circuits, better medical imaging, such as in mammography, and improved forensics."

The high intensity X-ray beams will permit scientific and medical research to be performed in less time with higher accuracy. In some cases the research was not feasible in standard X-ray laboratories. Also, the instrument could permit the use of smaller, lower cost and safer X-ray sources.

- end -

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

February 1, 1996

VIDEO ADVISORY: V96-11

NEW SPACE SHUTTLE LIGHTWEIGHT EXTERNAL TANK ON NTV

Friday's video news file will air footage and interviews on a new, lightweight external tank that will be used in the future on the Space Shuttle fleet. The aluminum lithium tank will undergo structural integrity testing at NASA's Marshall Space Flight Center, Huntsville, AL, over the next six months. The lightweight tank will allow the Shuttle fleet to achieve higher inclinations and carry heavier payloads into space -- capabilities that will help in the building of the international Space Station. NASA TV also will replay features on a Planetary Photojournal archive accessible on the Internet via the World Wide Web.

Video News Files air at noon, 3, 6 and 9 p.m. EST

ITEM #1: LIGHTWEIGHT EXTERNAL TANK
New lightweight Space Shuttle external tank arrives for testing at Marshall.

ITEM #2: INTERVIEW -- PARKER COUNTS
External Tank Project Manager compares the lightweight tank to the current tank.

ITEM #3: NEW ONLINE PHOTO ARCHIVE AVAILABLE VIA INTERNET
New Planetary photo archive online via the Internet.

ITEM #4: INTERVIEW -MYCHE MCAULEY, PLANETARY DATA SYSTEMS
JPL employee discusses new online photo archive.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

Ed Campion
Headquarters, Washington, DC
(Phone: 202/358-1778)

February 1, 1996

June Malone
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-7061)

RELEASE: 96-20

SUPER LIGHTWEIGHT EXTERNAL TANK CERTIFICATION TESTING TO BEGIN

A new super lightweight external tank for the Space Shuttle took an important first step toward flight today with the arrival of a special test article at NASA's Marshall Space Flight Center, Huntsville, AL.

The Aluminum Lithium Test Article arrived at Marshall by barge for testing at the Center's Structural and Dynamic Test Stand. Over the next six months, the test article will undergo pressure and other tests to simulate the launch environment to verify the structural design of the tank.

"This is a significant milestone for the Super Lightweight Tank program," said External Tank Project Manager Parker Counts. "We're excited about testing the special segment at Marshall and making a significant move toward flight certification and eventual first flight."

While the test article is only 40 feet long, compared to the 154 feet of an external tank, its diameter of 27 feet is the same. It also includes a new structural design that will be incorporated in the new super lightweight tank. The test article is essentially a modified segment of the aluminum lithium liquid hydrogen tank with a liquid oxygen tank dome at one end. The special test segment replicates design enhancements that are built into all four of the sections that will make up the new liquid hydrogen tank.

The new external tank will be the same size as the current one but will be approximately 7500 pounds lighter. "Each pound we can take from the external tank is one more pound we can take to orbit. This becomes especially important when launching the international Space Station into its proper orbit in 1997," Counts said.

-more-

The super lightweight tank will be constructed of aluminum lithium which is a lighter, stronger material than the metal alloy currently used in the production of the Space Shuttle's external tank. Taking advantage of the high strength, lower density properties of aluminum lithium, the walls of the hydrogen tank will be manufactured in an orthogonal waffle-like pattern.

The Shuttle's current external tank as well as the new super lightweight tank are manufactured by Lockheed Martin Corp. at NASA's Michoud Assembly Facility, LA. The tank contains the liquid hydrogen and liquid oxygen propellants consumed by the Shuttle's three main engines during launch. The External Tank Project is managed for the Space Shuttle program at Marshall.

- end -

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

February 1, 1996

Edward McNevin
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

RELEASE: 96-21

PLANETARY IMAGES AVAILABLE AT NEW WEB SITE

One of the world's most popular photo collections -- images of the planets produced by the U.S. space program -- goes online in a central location today as part of a joint project between NASA and the U.S. Geological Survey (USGS).

NASA's Planetary Photojournal, accessible on the Internet via the World Wide Web, enables access to NASA's archive of planetary images for viewing and use by the public, scientists, educators and publishers.

"This Web site opens a fresh window on the planets and what we have learned from them," said Wesley T. Huntress, Jr., NASA Associate Administrator for Space Science. "Communication is the final and probably the most important step in the scientific process. Using some of the same computer technology that helps us generate new discoveries, this partnership with the USGS will allow us to share this knowledge with people everywhere."

"The new system currently provides access to images residing in collections at the Jet Propulsion Laboratory (JPL), Pasadena, CA, and at the USGS, Flagstaff, AZ, along with captions and other information such as mapping data," said Sue LaVoie, a member of the development team at JPL. The site features thumbnail and browse-size versions of the images for viewing and provides user-friendly digital downloading of images in a variety of formats and sizes.

Access is provided not only to the most popular images but to the entire primary image data sets from various space missions, LaVoie added. Links are provided to commercial vendors for ordering hard copies of photographs, slides, CD-ROMs and other imaging data products from the collection.

-more-

Other links in the new system allow users to jump to and browse other space image data collections, LaVoie said. Pointers and links to other sites, such as space mission home pages, also are featured.

New images released from NASA missions will be placed on the system in parallel with release to the news media.

Addresses for the new NASA Planetary Photojournal are:

http://www-pdsimage.jpl.nasa.gov/PIA (at JPL)
http://pdsimage.wr.usgs.gov/PIA (at the USGS)

At JPL, the Planetary Photojournal development team was led by LaVoie and included Eric DeJong, Elizabeth Duxbury, Myche McAuley, Edward McNevin III and Jurrie van der Woude, while the USGS team was led by Larry Soderblom and included Eric Eliason and Haig Morgan.

- end -

NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. NASA releases also are available via CompuServe using the command GO NASA.

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

Ed Campion
Headquarters, Washington, DC
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Kyle Herring
Johnson Space Center, Houston
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February 2, 1996

RELEASE: 96-22

CREW NAMED FOR FIFTH SHUTTLE/MIR DOCKING; COMMANDER FOR SIXTH

U.S. Navy Captain Michael A. Baker will command the fifth scheduled Shuttle mission to dock with Russia's Space Station Mir (STS-81) and U.S. Air Force Colonel Charles J. Precourt will command the sixth (STS-84).

On STS-81, set for December 1996, Astronaut John E. Blaha (Colonel, USAF, Ret.) will return from a five-month stay aboard the station and Dr. Jerry M. Linenger (Captain, Medical Corps, USN) will take his place aboard the orbiting laboratory for five months. Linenger will return on STS-84 and be replaced aboard Mir by C. Michael Foale, Ph.D.

Other crew members named to join Baker, Blaha and Linenger on the STS-81 flight are Pilot Brent W. Jett, Jr. (Lt. Cdr., USN), and Mission Specialists John M. Grunsfeld, Ph.D., Marsha S. Ivins, and Peter J.K. "Jeff" Wisoff, Ph.D. The remainder of Precourt's STS-84 crew will be named later.

The fifth docking mission will carry the Spacehab double module providing additional middeck locker space for secondary experiments. During the five days of docked operations with Mir, the crews will transfer water and supplies from one spacecraft to the other. A spacewalk by Linenger and one of his Russian cosmonaut crewmates will be conducted during his stay on the space station after Atlantis departs.

The sixth docking mission, also carrying the Spacehab double module, will have Atlantis docked with the station for five days transferring supplies and experiments between the two spacecraft in addition to the astronaut exchange.

-more-

Baker, 42, has flown three times on the Shuttle -- STS-43 aboard Atlantis in August 1991, STS-52 on Columbia in October 1992 and STS-68 on Endeavour in September/October 1994. Most recently he was director of operations for NASA at the Gagarin Cosmonaut Training Center in Star City, Russia, responsible for the coordination and implementation of mission operations activities for the Shuttle/Mir program. Baker earned a bachelor of science degree in aerospace engineering in 1975 from the University of Texas. He considers Lemoore, CA, his hometown.

Precourt, 40, has flown on two space missions including the first docking of the Shuttle Atlantis to Mir on STS-71 in June/July 1995. His other mission was aboard Columbia in April/May 1993. He currently is director of operations for NASA in Star City, Russia, having replaced Baker last November. Precourt earned a master of science degree in engineering management from Golden Gate University in 1988 and a master of arts in national security affairs and strategic studies from the United States Naval War College in 1990. He considers Hudson, MA, his hometown.

Jett, 37, just completed his first Shuttle mission, STS-72, which included two rendezvous. He has a master of science degree in aeronautical engineering from the Naval Postgraduate School, earned in 1989. Jett considers Fort Lauderdale, FL, his hometown.

Grunsfeld, 37, flew aboard Endeavour on the STS-67 mission in March 1995. He earned his master of science and doctor of philosophy degrees from the University of Chicago in 1984 and 1988, respectively.

Ivins, 44, will be making her fourth flight on the Shuttle. She flew on STS-32 aboard Columbia in January 1990, STS-46 on Atlantis in July/August 1992, and STS-62 on Columbia in March 1994. Most recently Ivins has supported launch and landing activities at the Kennedy Space Center as the lead for the Astronaut Support Personnel team. She earned a bachelor of science degree in aerospace engineering from the University of Colorado in 1973.

Wisoff, 37, flew on STS-57 on Endeavour in June/July 1993, and with Baker on STS-68 aboard Endeavour in September/October 1994. He earned a master of science and doctorate in applied physics from Stanford University in 1982 and 1986, respectively. Wisoff was born in Norfolk, VA.

Blaha, 53, will complete his fifth flight into space. He flew on STS-29 aboard Discovery in March 1989, STS-33 also on Discovery in November 1989, STS-43 aboard Atlantis in August 1991 and STS-58 on Columbia in October/November 1993. He earned a master of science degree in aeronautical engineering from Purdue Unviersity in 1966. Blaha was born in San Antonio, TX.

Linenger, 41, flew on STS-64 aboard Discovery in September 1994. He earned his doctorate in medicine from Wayne State University in 1981. Linenger considers Eastpointe, MI, and Coronado, CA, his hometowns.

Foale, 39, flew on STS-45 aboard Atlantis in 1992, Discovery's STS-56 mission in 1993 and most recently on the STS-63 mission in February 1995 which saw Discovery rendezvous with Mir, approaching to within 37 feet of the space station. He considers Cambridge, England, his hometown. Foale completed his doctorate in laboratory astrophysics at Cambridge University in 1982.

- end -

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

Ed Campion
Headquarters, Washington, DC
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February 2, 1996

RELEASE: 96-23

O'CONNOR TO LEAVE NASA

Space Shuttle Director Bryan D. O'Connor announced today that he will leave NASA at the end of this month.

In making his announcement, O'Connor released the following statement.

"The current transition underway in the Shuttle program management presents an occasion for me to leave NASA without causing a significant disruption. Given that condition, I am taking this opportunity to pursue other interests.

"It has been an honor and privilege to work with the dedicated men and women who work on the Shuttle program. It has been their exceptional work that has allowed 49 safe and successful missions since the Shuttle's return to flight."

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

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February 5, 1996

NOTE TO EDITORS: N96-6

BRIEFINGS SET FOR REFLIGHT OF THE TETHERED SATELLITE

The goals and objectives of the 75th Space Shuttle mission will be discussed during a series of preflight briefings at NASA's Johnson Space Center, Houston, and the Marshall Space Flight Center, Huntsville, AL, on Feb.14.

The planned 14-day STS-75 mission aboard Columbia will be highlighted by the deployment of the Italian Tethered Satellite System (TSS), which first flew on STS-46 in 1992 and the third flight of the United States Microgravity Payload (USMP-3), a series of materials science experiments mounted on a pallet in the Shuttle's cargo bay. The TSS is expected to be unreeled to a distance of almost 13 miles from Columbia at the end of a tether to study the management of satellites in orbit and the production of electricity in low-Earth orbit.

The briefings will begin at 9 a.m. EST at Johnson with the Mission Overview briefing featuring Lead Flight Director Chuck Shaw. At 10 a.m. EST the briefing will shift to Marshall for an overview of the TSS, followed at 12:30 p.m. EST with the USMP-3 briefing. Scientific data from the TSS and the USMP-3 will be acquired and analyzed at the Payload Operations Control Center at Marshall. At 2 p.m. EST a briefing on the latest findings from the Commercial Protein Crystal Growth experiment will be held at Johnson. The day's briefings will conclude at Johnson at 3 p.m. EST with the Crew News Conference.

All of the briefings will be carried live on NASA Television with two-way question and answer capability from participating NASA locations.

- more

Following is the briefing schedule (all times are EST):

February 14, 1996

9 a.m. Mission Overview (originating from Johnson)
Chuck Shaw, Lead Flight Director

10 a.m. Tethered Satellite System Overview (originating from Marshall)
Robert McBrayer, TSS Mission Manager
Dr. Nobie Stone, TSS Mission Scientist
Carlo Bonifazi, ASI TSS Program Mgr. (Italian Space Agency)

12:30 p.m. USMP-3 Overview (originating from Marshall)
Sherwood Anderson, USMP-3 Mission Manager
Dr. Peter Curreri, USMP-3 Mission Scientist
Dr. Archibald Fripp, AADSF Experiment
Dr. Robert Gammon, Zeno Experiment
Dr. Martin Glicksman, IDGE Experiment
Dr. Iwan Anderson, Mephisto Experiment
Dr. Kurt Sacksteder, FFFT Investigation

2 p.m. Commercial Protein Crystal Growth Experiment
Overview (from Johnson)
Dr. Larry DeLucas, CPCG Principal Investigator

3 p.m. Crew News Conference (originating from Johnson)
Andrew Allen, Commander
Scott Horowitz, Pilot
Jeffrey Hoffman, Mission Specialist 1
Maurizio Cheli, Mission Specialist 2
Claude Nicollier, Mission Specialist 3
Franklin Chang-Diaz, Mission Specialist 4 (Payload Commander)
Umberto Guidoni, Payload Specialist

NASA Television is located on Spacenet 2, Transponder 5, Channel 9 at 69 degrees West longitude. The transponder frequency is 3880 Mhz and the audio subcarrier is 6.8 Mhz. Polarization is horizontal.

- end -

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

For Release

February 7, 1996

RELEASE: 96-25

RUSSIAN INSTRUMENT ON MARS LANDER WILL MONITOR ATMOSPHERIC DUST

A small, lightweight Russian laser-ranging device designed to measure dust and haze in the Martian atmosphere has been selected by NASA officials to fly aboard a U.S. Mars lander spacecraft due for launch in January 1999.

Known as the 1998 Mars Surveyor Lander, the mission will be the first ever sent to the polar regions of Mars, where it should encounter layers of icy terrain that represent a preserved record of the planet's climate history.

The laser-ranging device, or lidar, will be provided to NASA by Dr. Vyacheslav Linkin of the Space Research Institute (IKI) of the Russian Academy of Science, under the sponsorship of the Russian Space Agency (RSA).

"Measurements from this device should help us better understand the relationship between the amount of dust and aerosols in the lower-most part of the Martian atmosphere and the planet's regional weather conditions," said Wesley T. Huntress Jr., NASA Associate Administrator for Space Science. "In addition to this important science goal, the lidar will be the first Russian instrument to fly aboard a U.S. planetary spacecraft, so it represents a new degree of international cooperation in the exploration of our solar system."

Mounted on top of the lander for a clear view of the Martian sky, the 2.2 lb. (approximately 1 kilogram) instrument will send short pulses of focused light into the atmosphere and then measure the amount of light scattered back. This effect is similar to the way that automobile headlights reflect fog -- the thicker the fog, the more light that is scattered back to the car's driver. The Mars-bound lidar device also can operate in a passive mode, where it uses the Sun as a light source and measures the brightness of the sky.

The 1998 Mars Surveyor Lander also will carry a lightweight camera to take images of the surrounding terrain during the spacecraft's final descent, and an integrated surface science payload that includes a mast-mounted imager, a meteorological station, a soil composition analyzer and a robotic arm to dig trenches in the icy soil of the south pole.

-more-

A companion spacecraft to the Lander, called the 1998 Mars Surveyor Orbiter, will be launched in December 1998. Russia's IKI is providing optical hardware for one of the Orbiter's instruments, the Pressure Modulator Infrared Radiometer.

Both of these spacecraft are part of NASA's Mars Surveyor Program, a decade-long series of cost-capped missions to Mars featuring two launches every 26 months. Lockheed Martin Astronautics, Denver, CO, is building both the 1998 Orbiter and Lander for NASA under a $94 million contract.

The Mars Surveyor Program kicks off November 1996 with the launch of the Mars Global Surveyor Orbiter. The Mars Pathfinder Lander, developed under NASA's Discovery Program, will be launched in December 1996.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

February 7, 1996

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RELEASE: 96-26

POLAR LAUNCH COMPLETES GLOBAL GEOSPACE SCIENCE CONSTELLATION

NASA's Polar spacecraft, scheduled for a February launch from Vandenberg Air Force Base (VAFB), CA, is a key element of a constellation of satellites which promise to revolutionize understanding of the Sun's influence on Earth's space environment.

"Polar will launch space physicists on a new voyage of discovery and exploration," said Dr. Robert Carovillano, Polar Program Scientist at NASA Headquarters, Washington, DC. "Polar is the main link in a very critical chain of laboratories in space which will study both the very inner and outer frontiers of the chain of processes which intimately connects the Sun with the Earth and the other planets. This launch marks the beginning of a new era in our understanding of the interactions of these tremendous forces."

The final mission in NASA's Global Geospace Science (GGS) program, the Polar laboratory will be launched in an orbit which loops over the Earth's poles for a three-year mission to study the movement of energetic charged particles above the polar regions. It will give scientists new perspectives on how Earth's space environment is affected by continual bombardment from radiation and particles from the Sun, data which eventually could help scientists forecast "space weather".

- more -

The most well-known effects of these particles are the sometimes spectacular curtains of light known as the Northern and Southern Lights, or auroras. More serious effects are the damage the particles can cause when severe solar-driven storms damage spacecraft electronics and even disrupt communications and power networks on Earth -- systems on which society is becoming ever more dependent.

"Polar will help us in a new area of research that scientists call 'space weather' where the objective is to make relevant observations of our solar-terrestrial system. Then, we will put that data into models that will predict where and when various types of space disturbances will occur," said Dr. Robert Hoffman, Polar Project Scientist at NASA Goddard Space Flight Center, Greenbelt, MD. "Information from Polar about the radiation environment that satellites and spacecraft experience will enable the development of better radiation-tolerant technology for space systems."

The Polar laboratory will perform simultaneous, coordinated measurements of the key regions of Earth's geospace, or space environment, with WIND, which was launched November 1994 and is now measuring properties of the solar wind. A large array of ground-based scientific observatories and mission-related theoretical investigations also will be involved.

NASA is collaborating with the European Space Agency and the Japanese Institute of Space and Astronautical Sciences in three additional solar-terrestrial missions, Geotail, SOHO and Cluster. These missions, together with GGS, make up the International Solar Terrestrial Physics (ISTP) science initiative.

The Polar spacecraft, carrying 11 instruments, is scheduled for launch on a Delta II rocket from the Western Space and Missile Center, at VAFB. The instruments, supplied by industry and university teams as well as by NASA, will study a vast range of phenomena from electromagnetic radiation to charged particles from very low to relativistic energies. Especially important on Polar are three high resolution imagers looking down on the Earth's polar region. The instruments will image at wavelengths from the visible to ultraviolet and into the X-ray region.

"The aim of ISTP is to understand the physical effects of solar activity on interplanetary space and the Earth's space environment. This will lead to the capability of predicting the responses of each part of the Sun-Earth system to solar activity," said Dr. Mario Acuna, ISTP Project Scientist at Goddard.

Polar's orbit around the Earth will be inclined 86 degrees to the equator. The altitude of the furthest point from the Earth on the orbit -- the apogee -- will be eight Earth radii (32,000 miles), and the closest point -- the perigee -- will be 0.8 Earth radii (3,200 miles).

Polar is a spin-stabilized cylinder-shaped spacecraft 7.9 feet in diameter and 6.9 feet high with many appendages for instrument sensors. The dry weight of the spacecraft is about 2,200 pounds with an additional 660 pounds of hydrazine propellant for orbit and attitude control.

Several NASA facilities will play key roles in the collection and dissemination of Polar science data. NASA's Deep Space Network will be used to command the spacecraft and to collect Polar science data via radio link. At Goddard, raw data will be processed, organized and stored. The project's Central Data Handling Facility will produce "key parameter data" for rapidly surveying the much larger volume of raw data from the mission. Detailed analysis of the data will be performed by investigators at their own sites and the data will be shared through the NASA Science Internet connections throughout the United States, Japan and Europe.

Spacecraft Pre-Launch Processing

The Polar spacecraft arrived at Vandenberg aboard a C-5 military aircraft on Oct. 16, 1995. It was transported to NASA Hangar 836, NASA's spacecraft and launch vehicle checkout facility at Vandenberg, to begin prelaunch checkout activities. This work included propulsion system checks and electrical system testing, and a series of functional tests which included checkout of each of the spacecraft's instruments.

On Nov. 10, Polar was transported from Hangar 836 located on South Vandenberg to NASA Hazardous Processing Facility 1610 located on North Vandenberg near Space Launch Complex 2. There the spacecraft was fueled with its hydrazine control propellant on Nov. 14 - 15. Polar was transported to the launch pad on Jan. 23 and mated to the Delta II rocket. The nose fairing installation activities placing it around the spacecraft began on Jan. 29.

Delta-233 Processing

Delta-233, a Delta II launch vehicle manufactured by McDonnell Douglas, began its preparation at NASA's Space Launch Complex 2 with the erection of the first stage on Nov. 29, 1995. The second stage was hoisted atop the first stage on Dec. 1, and the solid rocket boosters were erected in sets of three on Dec. 5 - 7.

The electrical qualification testing of Delta-233 was performed on Jan. 5-6. An electrical test to verify the in-flight events which the vehicle normally performs was conducted on Jan. 17. The vehicle was partially loaded with liquid oxygen for a first stage leak check on Jan. 18. A Flight Program Verification was performed on Jan. 25, a test which verified the actual flight events and associated flight software to be used on the Delta-233/ Polar mission.

Loading of the second stage with its complement of storable propellants, an activity which normally occurs before the countdown begins, was scheduled to occur two days before launch on Feb. 22. Loading of the first stage with liquid oxygen and RP-1, a highly refined kerosene, is performed in the terminal countdown sequence which begins approximately three hours before launch.

Information about the Polar mission and the ISTP are available on the Internet at the following home page locations:

Polar: http://www-istp.gsfc.nasa.gov/ISTP/ggs_project.html

ISTP: http://www-istp.gsfc.nasa.gov/

Goddard manages the Polar project for NASA 's Office of Space Science, Washington, DC.

- end -

NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. NASA releases also are available via CompuServe using the command GO NASA.

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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Patrick Mellody
Headquarters, Washington, DC
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For Release
February 8, 1996

NOTE TO EDITORS: N96-7

NASA HISTORY SERIES OFFERS A LOOK BEHIND THE SCENES

Exploring the Unknown: Selected Documents in the History of The U.S. Civil Space Program, has just been published through the Government Printing Office in cooperation with the NASA History Office.

The publications tell the story of the U.S. space program through the actual documents which enabled individuals to plan and accomplish the nation's mission of exploring the unknown.

Volume 1, the first of three to be published, is subtitled *"Organizing for Exploration."* It deals with more than 200 documents, many of which are published for the first time. Each section includes a forward which provides context, bibliographical details and background information necessary to understand the documents. The documents are separated into four eras, beginning with a narrative explaining the historical significance of the documents and their place in the timeline of the space program.

Volume II, due out at the end of the year, will deal with NASA's cooperative efforts with other organizations domestically and abroad. In July 1997 the series will be completed with publication of Volume III, which will take a detailed look at the Agency's programs and projects.

The first volume is edited by John M. Logsdon, Director of the Center for International Science and Technology Policy and the Space Policy Institute of George Washington University, Washington, DC.

Copies of Volume I can be purchased for $43.00 through the NASA Information Center, Code COL-19, NASA Headquarters, Washington, DC 20546, or by calling 202/358-0000 for more information. The order number is SP-4407.

-end-

News Release

National Aeronautics and
Space Administration

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For Release

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Bruce Buckingham
Kennedy Space Center, Fla.
(Phone: 407/867-2468)

February 9, 1996

NOTE TO EDITORS: N96-8

NASA MANAGERS SET FEBRUARY 22 AS LAUNCH DATE FOR 75TH SPACE SHUTTLE MISSION

NASA managers today set February 22, 1996 as the official launch date for Space Shuttle Columbia on Mission STS-75. The STS-75 mission will be highlighted by a 12-1/2 mile deployment and retrieval of a tethered satellite that is designed to investigate new sources of spacecraft power and ways to study Earth's upper atmosphere. The STS-75 mission also will see the third flight of the United States Microgravity Payload which continues research efforts into development of new materials and processes that could lead to a new generation of computers, electronics and metals.

Launch of Columbia on February 22 is planned for 3:18 p.m. EST from Kennedy Space Center's Launch Complex 39-B. The STS-75 mission is scheduled to last 13 days, 16 hours, 14 minutes. An ontime launch on February 22 would produce a landing at Kennedy Space Center's Shuttle Landing Facility on March 7 at 7:32 a.m. EST.

The STS-75 mission will be the 19th mission for Columbia and the 75th for the Space Shuttle system.

-end-

96-27

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPACE SHUTTLE MISSION STS-75

PRESS KIT
FEBRUARY 1996

TETHERED SATELLITE SYSTEM-1R
(TSS-1R)

UNITED STATES MICROGRAVITY PAYLOAD-3
(USMP-3)

For Information on the Space Shuttle

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Bruce Buckingham Kennedy Space Center, FL	Launch Processing KSC Landing Information	407/867-2468
June Malone Marshall Space Flight Center, Huntsville, AL	External Tank/SRBs/SSMEs	205/544-0034
Cam Martin Dryden Flight Research Center, Edwards, CA	DFRC Landing Information	805/258-3448

For Information on STS-75 Experiments & Activities

Jerry Berg Marshall Space Flight Center, Huntsville, AL	TSS	205/544-0034
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Debbie Rahn Headquarters, Washington, DC	International Cooperation	202/358-1639
Jim Cast Headquarters, Washington, DC	CPCG	202/358-1779

CONTENTS

RELEASE: 96-27

REFLIGHT OF TETHERED SATELLITE HIGHLIGHTS STS-75

NASA's second Shuttle mission of the year and the 75th in the history of the program will be highlighted by the flight of the Italian Tethered Satellite System designed to investigate new sources of spacecraft power and ways to study Earth's upper atmosphere. STS-75 also will see Columbia's seven-person crew work with the United States Microgravity Payload which continues research efforts into development of new materials and processes that could lead to a new generation of computers, electronics and metals.

The STS-75 crew will be commanded by Andrew Allen, who will be making his third Shuttle flight. Scott Horowitz will serve as pilot and will be making his first space flight. Jeff Hoffman will serve as Mission Specialist-1 and will be making his fifth flight. There will be two European Space Agency astronauts -- Maurizio Cheli and Claude Nicollier. Cheli will be serving as Mission Specialist 2, making his first flight, and Nicollier, serving as Mission Specialist-3, will be making his third flight. NASA astronaut Franklin Chang-Diaz, serving as Payload Commander and Mission Specialist-4, will be making his fifth flight. Also serving as Payload Specialist-1 for STS-75 is Umberto Guidoni, from the Italian Space Agency (ASI).

Launch of Columbia is currently targeted for February 22, 1996, at approximately 3:18 p.m. EST from Kennedy Space Center's Launch Complex 39-B. The STS-75 mission is scheduled to last 13 days, 16 hours, 14 minutes. An ontime launch on February 22 would produce a landing at Kennedy Space Center's Shuttle Landing Facility on March 7 at 7:32 a.m. EST.

The Tethered Satellite System's flight, designated TSS-1R ("R" for reflight), will be a scientific adventure aimed at understanding the possibilities for putting tether technology to work in space for a variety of applications. Tethered systems can be used to generate thrust to compensate for atmospheric drag on orbiting platforms such as the international Space Station. Deploying a tether towards Earth could place movable science platforms in hard-to-study atmospheric zones. Tethers also could be used as antennas to transmit extremely low frequency signals able to penetrate land and sea water, providing for communications not possible with standard radio. Non-electrical tethers can be used to generate artificial gravity and to boost payloads to higher orbits.

Computer-based communications traveling at the speed of light along the information superhighway have led to a revolution in the way we conduct business, and our lives. The third United States Microgravity Payload (USMP-3) continues a series of missions aimed at understanding the basic properties of materials in order to produce better semiconductors for complex computers and other high-tech electronics. USMP science also could help produce stronger metal alloys sought by the aircraft and automobile industries to

improve their economic competitiveness. Millions of dollars are spent each year on ground-based studies in these areas, but on Earth, gravity overshadows or distorts many measurable results. The near-weightless environment aboard the Space Shuttle unmasks subtle physical processes, giving researchers a clearer look into the laws of nature, a perspective that cannot be seen in laboratories on Earth.

The STS-75 mission will be the 19th mission for Columbia and the 75th for the Space Shuttle system.

- end -

Media Services Information

NASA Television Transmission

NASA television is available through the Spacenet-2 satellite system. Spacenet-2 is located on Transponder 5, at 69 degrees West longitude, frequency 3880.0 MHz, audio 6.8 MHz.

The schedule for television transmissions from the orbiter and for mission briefings will be available during the mission at Kennedy Space Center, FL; Marshall Space Flight Center, Huntsville, AL; Dryden Flight Research Center, Edwards, CA; Johnson Space Center, Houston, TX; and NASA Headquarters, Washington, DC. The television schedule will be updated to reflect changes dictated by mission operations.

Television schedules also may be obtained by calling COMSTOR at 713/483-5817. COMSTOR is a computer data base service requiring the use of a telephone modem. A voice update of the television schedule is provided daily at noon Eastern time.

Status Reports

Status reports on countdown and mission progress, on-orbit activities and landing operations will be produced by the appropriate NASA newscenter.

Briefings

A mission press briefing schedule will be issued prior to launch. During the mission, status briefings by a flight director or mission operations representative and when appropriate, representatives from the payload team, will occur at least once each day. The updated NASA television schedule will indicate when mission briefings are planned.

Internet Information

The NASA Headquarters Public Affairs Internet Home Page provides access to the STS-75 mission press kit and status reports. The address for the Headquarters Public Affairs Home Page is:
http://www.nasa.gov/hqpao/hqpao_home.html

Informational materials, such as status reports and TV schedules, also are available from an anonymous FTP (File Transfer Protocol) server at **ftp.hq.nasa.gov/pub/pao**. Users should log on with the user name "anonymous" (no quotes), then enter their E-mail address as the password. Within the /pub/pao directory there will be a "readme.txt" file explaining the directory structure.

Pre-launch status reports from KSC are found under **ftp.hq.nasa.gov/pub/pao/statrpt/ksc**, and mission status reports can be found

under **ftp.hq.nasa.gov/pub/pao/statrpt/jsc**. Daily TV schedules can be found under **ftp.hq.nasa.gov/pub/pao/statrpt/jsc/tvsked**.

Access by CompuServe

Users with CompuServe accounts can access NASA press releases by typing "GO NASA" (no quotes) and making a selection from the categories offered.

STS-75 Quick Look

Launch Date/Site:	February 22, 1996/KSC Launch Pad 39-B
Launch Time:	3:18 PM EST
Launch Window:	2 hours, 30 minutes
Orbiter:	Columbia (OV-102), 19th flight
Orbit Altitude/Inclination:	160 nautical miles/28.45 degrees
Mission Duration:	13 days, 16 hours, 14 minutes
Landing Date:	March 7, 1996
Landing Time:	7:32 AM EST
Primary Landing Site:	Kennedy Space Center, Florida
Abort Landing Sites:	Return to Launch Site - KSC Transoceanic Abort Sites - Ben Guerir, Morocco Moron, Spain Abort-Once Around - Edwards AFB, CA
Crew:	Andrew Allen, Commander (CDR) Scott Horowitz, Pilot (PLT) Jeff Hoffman, Mission Specialist 1 (MS 1) Maurizio Cheli, Mission Specialist 2 (MS 2) Claude Nicollier, Mission Specialist 3 (MS 3) Franklin Chang-Diaz, Mission Specialist 4 (MS 4) Umberto Guidoni, Payload Specialist 1 (PS 1)
Shifts:	Red Team: Horowitz, Cheli, Guidoni Blue Team: Nicollier, Chang-Diaz White Team: Allen, Hoffman (joins Blue team after TSS)
EVA Crew (if needed):	Franklin Chang-Diaz (EV 1), Claude Nicollier (EV 2)
Cargo Bay Payloads:	Tethered Satellite System USMP-3 OARE
In-Cabin Payloads:	Middeck Glovebox Commercial Protein Crystal Growth

Developmental Test Objectives/Detailed Supplementary Objectives

DTO 301D: Ascent Structural Capability Evaluation
DTO 307D: Entry Structural Capability
DTO 312: External Tank Thermal Protection System Performance
DTO 667: Portable In-Flight Landing Operations Trainer
DTO 805: Crosswind Landing Performance
DSO 331: Interaction of Shuttle Launch Entry Suits on Egress Locomotion
DSO 487: Immunological Assessment of Crewmembers
DSO 491: Characterization of Microbial Transfer Among Crewmembers
DSO 492: In-Flight Evaluation of a Portable Clinical Blood Analyzer
DSO 493: Monitoring Latent Virus Reactivation and Shedding in Astronauts
DSO 802: Educational Activities
DSO 901: Documentary Television
DSO 902: Documentary Motion Picture Photography
DSO 903: Documentary Still Photography

Shuttle Abort Modes

Space Shuttle launch abort philosophy aims toward safe and intact recovery of the flight crew, orbiter and its payload. Abort modes for STS-75 include:

* Abort-To-Orbit (ATO) -- Partial loss of main engine thrust late enough to permit reaching a minimal 105-nautical mile orbit with the orbital maneuvering system engines.

* Abort-Once-Around (AOA) -- Earlier main engine shutdown with the capability to allow one orbit of the Earth before landing at the Kennedy Space Center, FL.

* Transoceanic Abort Landing (TAL) -- Loss of one or more main engines midway through powered flight would force a landing at either Ben Guerir, Morocco; or Moron, Spain.

* Return-To-Launch-Site (RTLS) -- Early shutdown of one or more engines, and without enough energy to reach a TAL site, would result in a pitch around and thrust back toward KSC until within gliding distance of the Shuttle Landing Facility.

Mission Summary Timeline

Flight Day One:
Launch/Ascent
TSS Checkout and Activation
USMP-3 Activation

Flight Day 2:
TSS Pre-Deploy Checkout
USMP-3 Operations

Flight Day 3:
TSS Flyaway
USMP-3 Operations

Flight Day 4:
TSS Science Operations and Retrieval
USMP-3 Operations

Flight Day 5:
TSS Retrieval and Docking
TSS Post-Retrieval Safing
USMP-3 Operations

Flight Day 6:
Middeck Glovebox Setup,

Flight Day 7-12
USMP-3 Operations

Flight Day 13:
USMP-3 Operations
Crew News Conference

Flight Day 14:
Flight Control System Checkout
Reaction Control System Hot-Fire
USMP-3 Deactivation
Cabin Stow

Flight Day 15:
Deorbit Prep
Deorbit Burn
Entry
KSC Landing

STS-75 Orbital Events Summary

(Based on a Feb. 22, 1996 Launch)

EVENT	MET	TIME OF DAY (EST)
Launch	0/00:00	3:18 PM, Feb. 22
OMS-2	0/00:42	4:00 PM, Feb. 22
TSS Flyaway	2/00:19	3:37 PM, Feb. 24
TSS On-Station	2/06:00	9:18 PM, Feb. 24
TSS Retrieve-1	3/03:30	6:48 PM, Feb. 25
TSS Docking	3/22:27	1:45 PM, Feb. 26
Crew News Conference	11/16:00	7:18 AM, March 5
Deorbit Burn	13/15:17	6:35 AM, March 7
KSC Landing	13/16:14	7:32 AM, March 7

Payload and Vehicle Weights

Vehicle/Payload	Pounds
Orbiter (Columbia) empty and 3 SSMEs	160,328
Tethered Satellite System	1,486
TSS Support Equipment	10.653
USMP-3 Experiments and Support Equipment	5,351
Commercial Protein Crystal Growth	57
Middeck Glovebox Experiment	395
Detailed Test/Supplementary Objectives	129
Shuttle System at SRB Ignition	4,523,663
Orbiter Weight at Landing	229,031

Crew Responsibilities

Payloads	**Prime**	**Backup**
Tethered Satellite System	Hoffman, Guidoni	Chang-Diaz, Nicollier
TSS Science	Chang-Diaz	Guidoni, Hoffman, Nicollier
USMP-3 Systems	Cheli	Chang-Diaz
Middeck Glovebox	Horowitz	Chang-Diaz
Earth Observations	Nicollier	Horowitz
EVA (if needed)	Chang-Diaz (EV 1)	Nicollier (EV 2)
Intravehicular Crewmember	Hoffman	--------
TSS Rendezvous/Proximity Ops	Allen	Horowitz, Nicollier

Science Aboard STS-75

Science aboard STS-75 comes in two parts: developing and understanding the basic dynamic and electrodynamic processes governing tethered systems. The flight also will focus on improving our basic knowledge on materials under microgravity conditions.

The TSS-1R flight will explore ideas and test concepts which may be applied to spacecraft of the future. It also will lead to an increased understanding of physical processes in the near-Earth space environment. USMP-3 is a pathfinder for 21st century technologies needed to spur development of a new generation of computers, electronics and metals.

During the first two days in space, the crew will activate and perform health checks on the Tethered Satellite System and the USMP equipment. On the third flight day, the astronauts will unreel the Tethered Satellite spaceward into Earth's electrically charged upper atmosphere, known as the ionosphere, to begin a series of studies about how the two interact. The major portion of TSS investigations will be conducted on flight days two through five, although data collection will continue throughout the mission.

Also on flight day two, crew members will activate major USMP experiments. Once microgravity experiments are running, most will be remotely controlled, a mode of operation known as telescience. Flight days five through 12 will be devoted mainly to conducting USMP investigations while the crew carries out combustion experiments in a device known as the glovebox, located in the middeck. During this time, Columbia's position will be adjusted periodically to give USMP experiments the best possible conditions based on measurement of microgravity disturbances by on-board sensors.

Tethered Satellite System Reflight (TSS-1R)

NASA and ASI long have planned the TSS reflight but a formal commitment awaited U.S. congressional approval for NASA to spend funds on the project. TSS originally was flown on the Space Shuttle STS-46 mission launched in July 1992. TSS deployment was curtailed when mechanical interference in the deployer reel assembly prevented full deployment of the satellite. The TSS reflight will focus on science objectives not accomplished on the STS-46 mission.

The TSS flight will be a scientific adventure aimed at understanding the possibilities for putting tether technology to work in space for many uses. TSS-1R will take advantage of the knowledge gained about tether dynamics during the first TSS mission. This mission will gather more crucial information needed to test theories for a variety of future tether applications.

For example, by reversing the direction of the current in the tether, the force caused by its interaction with Earth's magnetic field could put an object in

motion, serving to boost a spacecraft's orbit without using precious fuel. Also, a satellite could be moved up and down in orbit by releasing a tethered body from a primary spacecraft to position it into a desired location. Deploying a tether downwards towards Earth could place movable science platforms in hard-to-study atmospheric zones, such as the ozone region over the South Pole.

Tethers also may be used as antennas to transmit extremely low frequency signals to Earth. Such low frequency waves can penetrate land and sea water providing for communications not possible with standard radio. Tethers could place instrumented experimental aircraft models in the region 60 to 90 miles (100 to 150 kilometers) above Earth to gain a more accurate evaluation than is possible in wind tunnels, which only partially simulate flight conditions. It may one day be possible to create artificial gravity for long-duration missions, such as the first human trip to Mars, by using tethered systems.

TSS-1R experiments support seven mission objectives:

(1) Determine the amount of electrical current collected and voltage produced by the Tethered Satellite-Shuttle system as it interacts with Earth's ionospheric environment of charged gas (plasma) and its magnetic and electric fields.
(2) Understand how a tethered satellite makes contact with the ionospheric plasma and how an electrical current is extracted.
(3) Demonstrate electrical power generation, as a product of current and voltage, to determine how such a system could be used as a space-based power source.
(4) Verify tether control and dynamics from short (1.2 mile/2 kilometer) to long (12.8 mile/20.7 kilometer) deployment ranges.
(5) Demonstrate how neutral gas affects the satellite's plasma sheath and current collection, possibly enhancing tether-produced current.
(6) Determine how electrical current is conducted through the near-Earth plasma by measuring waves broadcast as the tethered satellite passes over a series of ground-based receiving stations, as well as how the tether acts as a low-frequency-band antenna.
(7) Learn to control tether motion by collecting data about how current flow produces force.

Earth's Charged-Particle Environment and the Tethered Satellite System

TSS-1R will make use of Earth's magnetic field and electrically charged atmosphere for a variety of experiments. Just as a bar magnet produces invisible lines of force known as "field lines," so does Earth. The Sun is a ball of electrically charged, or ionized, gas known as plasma. Plasma from the Sun, the solar wind, continually rushes past Earth; most is deflected around the planet, but some penetrates Earth's upper atmosphere, creating electric fields. Lightning is a commonly seen form of plasma. More than 99 percent of matter in the universe exists in the plasma state.

Speeding through the magnetized ionospheric plasma at almost five miles per second, the Tethered Satellite should create a variety of very interesting plasma-electrodynamic phenomena. These are expected to provide unique experimental opportunities, including the ability to collect an electrical charge and drive a large-current system, generate high voltages (around 5,000 volts) across the tether, control the satellite's electrical potential and its plasma sheath (the layer of charged particles created around the satellite), and generate low-frequency electrostatic and electromagnetic waves. While ground-based scientists are limited to small-scale experiments, Earth's ionosphere offers TSS-1R scientists a vast laboratory for space plasma experiments that cannot be conducted any other way.

The tether system consists of a five-foot (1.6-meter) diameter battery-powered satellite secured by a strong, electrically conducting cord, or tether, to the satellite support structure attached to the Shuttle orbiter. Data-gathering instruments are mounted in the Shuttle's cargo bay and middeck area, and on the satellite. During the second day on orbit, the STS-75 crew will reel the satellite out on its tether -- which looks like a long white shoelace - to about 12.5 miles (20.7 kilometers) away from the Shuttle, into the ionosphere. TSS-1R scientific instruments will allow scientists to examine the electrodynamics of the conducting tether system, as well as clarify the physical processes of the near-Earth space environment and, by extension, throughout the Solar System.

The conducting tether's generator mode will produce electrical current at a high voltage, using the same basic principle as a standard electrical generator. A small portion of the mechanical energy of the Shuttle's more than 17,500-mile-an-hour orbital motion will be converted into electrical energy as the electrically conducting metal strands in the tether's core pass through Earth's magnetic field lines.

The conductive outer skin of the Tethered Satellite will collect free electrons from the space plasma, and the resulting voltage will cause the electrons to flow down the conductive tether to the Shuttle. An electron accelerator, also called an electron gun, will then eject them back into space. Scientists expect the electrons to travel through the ionosphere to complete the loop required to close the circuit, just as a wire must close the circuit between the positive and negative poles of a car battery before current will flow. They will use a series of interdependent experiments -- conducted with electron guns and tether current-control hardware along with a set of diagnostic instruments -- to assess the nature of the external current loop within the ionosphere. This also will shed light on the processes by which the circuit is completed at the satellite and the Shuttle.

Scientific Investigations

Of the TSS-1R mission's 12 scientific investigations, NASA will provide six, ASI will provide five and the U.S. Air Force Phillips Laboratory will contribute one. Seven experiments include equipment that either stimulates or monitors the tether system and its environment, two will use ground-based

instruments to measure electromagnetic emissions from the TSS, two will use satellite and orbiter-mounted instruments to study tether dynamics and one will provide theoretical support in the area of electrodynamics.

Only a complete set of data on plasma and field conditions can give an accurate understanding of the space environment and its interaction with the tethered system. TSS-1R science investigations are complementary - while some instruments will measure magnetic fields, others will record particle energies and densities, and still others will map electric fields.

The Tethered Satellite System Deployer Core Equipment and Satellite Core Equipment, by Dr. Carlo Bonifazi of the ASI, Rome, will control the electrical current flowing through the tether between the satellite and the Shuttle, as well as make a number of basic electrical and physical measurements of the system.

The Research on Orbital Plasma Electrodynamics experiment, by Dr. Nobie Stone of Marshall, will study the behavior of charged particles in the ionosphere and ionized particles around the satellite under a variety of conditions. The Research on Electrodynamic Tether Effects experiment, by Dr. Marino Dobrowolny of the Italian National Research Council, Rome, will measure the electrical potential in the plasma sheath around the satellite and identify waves excited by the satellite and tether system. The goal of the Magnetic Field Experiment for TSS Missions investigation, by Prof. Franco Mariani of the Second University of Rome, will be to map the levels and fluctuations in magnetic fields around the satellite.

The Shuttle Electrodynamic Tether System investigation, by Dr. Brian Gilchrist of the University of Michigan, Ann Arbor, will study the ability of the Tethered Satellite to collect electrons by determining the current and voltage of the tethered system and measuring the resistance to current flow in the tether itself. The Shuttle Potential and Return Electron Experiment, by Dr. David Hardy of the U.S. Air Force Phillips Laboratory, Bedford, MA, will measure the charged particles around the Shuttle.

How well the Tethered Satellite -- the longest antenna ever placed in orbit -- broadcasts radio signals from space is the main goal of the Investigation of Electromagnetic Emissions for Electrodynamic Tether, by Dr. Robert Estes of the Smithsonian Astrophysical Observatory, Cambridge, MA, and the Observations at the Earth's Surface of Electromagnetic Emissions, by Dr. Giorgio Tacconi of the University of Genoa. The Tether Optical Phenomena experiment, by Dr. Stephen Mende of Lockheed Martin's Palo Alto Research Laboratory, CA, will use a hand-held low-light-level television camera operated by the crew, to provide visual data to help scientists answer questions about tether dynamics and optical effects generated by the Tethered Satellite.

The Investigation and Measurement of Dynamic Noise in the TSS, by Dr. Gordon Gullahorn of the Smithsonian Astrophysical Observatory, Cambridge, MA, and the Theoretical and Experimental Investigation of TSS Dynamics, by

Prof. Silvio Bergamaschi of the Institute of Applied Mechanics, Padua University, Italy, will analyze data from a variety of instruments to examine TSS oscillations over a wide range of frequencies. The Theory and Modeling in Support of Tethered Satellite Applications, by Dr. Adam Drobot of the Science Applications International Corp., McLean, VA, will provide theoretical electrodynamic support for the mission.

TSS-1R Responsibilities

TSS-1R mission responsibilities are shared between the Marshall and Johnson Centers, with ASI support at each location. Marshall provides project management, as well as system development, testing and integration. Science teams work under Marshall direction. Marshall will furnish real-time engineering support for the TSS-1R system components and tether dynamics. All remote commanding of science instruments aboard the satellite deployer and the Tethered Satellite will be executed by the Marshall Payload Operations Control team. Because of the unique interaction between the payload and the Shuttle, Mission Control in Houston is responsible for the crew's deployment and retrieval of the satellite. Mission Control also will manage the satellite in orbit and monitor the state of the instrument pallet, the deployer and the satellite. ASI will provide equipment engineering support during the mission.

TSS-1R Mission Management

TSS-1R is directed by Program Manager Tom Stuart, Office of Space Flight, and Science Payload Program Manager Mike Calabrese, Office of Space Science, NASA Headquarters, Washington, DC. Responsible for project management at Marshall are Mission Manager Robert McBrayer and Mission Scientist Dr. Nobie Stone, who also serves as project scientist and co-chairman of the Investigator Working Group. The chief engineer is Tony Lavoie.

At the Italian Space Agency, Rome, Italy's TSS-1R contribution is directed by ASI Program Manager Dr. Carlo Bonifazi, also the ASI Science Program Manager. Responsible for the Project Management of the satellite and the Core Equipment are, respectively, Raffaele Battaglia and Francesco Svelto. Dr. Marino Dobrowolny is ASI Mission Scientist, with his assistant Dr. Jean Sabbagh.

Tethered Satellite Flight Operations

The Tethered Satellite's primary scientific data will be taken during a planned 22-hour period when the satellite is extended to the maximum distance from the Shuttle and throughout the 7- to 10-hour period after the satellite has been reeled back to within approximately 1.2 miles (3.2 kilometers) of the Shuttle. Secondary science measurements will be taken before and during the 5.5-hour deployment and retrieval operations, and throughout the period when the satellite is within approximately 1.5 miles of the Shuttle.

Most activities not carried out by the crew will be controlled by command sequences stored in an onboard computer. To make the mission more flexible, however, modifications to these sequences may be uplinked, or commands may be sent in real-time to the instruments aboard the Shuttle. During the mission, teams of scientists will be stationed in the Science Operations Area at Marshall's Spacelab Mission Operations Control Center.

The responsibility for flying the Tethered Satellite, controlling the stability of the satellite, tether and Columbia, lies with the flight controllers in Mission Control at the Johnson Space Center in Houston. The primary flight control positions that will contribute to the flight of the Tethered Satellite System are the Rendezvous Guidance and Procedures (RGPO, commonly called Rendezvous) area and the Payloads area.

Rendezvous officers will oversee the dynamic phases of the deployment and retrieval of the satellite and are responsible for determining the correct course of action to manage any tether dynamics. To compute corrective actions, the Rendezvous officers will combine data from their workstations with inputs from several investigative teams. The Payloads area will oversee control of the satellite systems, the operation of the tether deployer and all other TSS systems. Payloads also serves as the liaison between Mission Control and the science investigators at Marshall, where all real-time commands for science operations will originate. Columbia's crew will control the deployer reel and the satellite thrusters from onboard the Shuttle.

Deploy Operations

The satellite will be deployed from Columbia when the cargo bay is facing away from Earth, with the tail slanted upward and nose pitched down. A 39-foot long boom, with the satellite at its end, is raised out of the cargo bay to provide clearance between the satellite and Shuttle during the deploy and retrieval operations. The orbital dynamics will result in the Tethered Satellite initially being deployed upward but at an angle of about 40 degrees behind Columbia's path.

As an electric motor at the end of the boom pulls tether off of the reel and a nitrogen gas thruster on the satellite pushes the satellite away from Columbia, the satellite will begin its journey. The deploy will begin very slowly, with the satellite eventually moving away from Columbia at about one-half mile per hour.

The initial movement of the satellite away from the boom will be at less than two-hundredths of one mile per hour. The speed of deploy will continue to increase, peaking after one and a half hours from the initial movement to about one mile per hour. At this point, when the satellite is slightly less than one mile from Columbia, the rate of deployment will be slowed briefly, a maneuver that will reduce the 40-degree angle of the satellite to the Shuttle to five degrees and will put the satellite almost directly overhead of Columbia, by the time about three miles of tether has been unwound.

When the satellite is almost 2,000 feet, or 600 meters, from Columbia, it will be allowed to begin a very slow rotation. Once the satellite reaches about 3.7 miles from the Shuttle, about two and a half hours after the start of deployment, the rotation rate will be increased by the satellite's attitude control system thrusters to a one-quarter-of-a-revolution-per-minute spin. The slight spin is needed for science operations with the satellite. After this, the speed of deployment will again be increased gradually, climbing to a peak separation from Columbia of almost 5 mph about four hours into the deployment, when the satellite is about nine miles away. From this point, the speed with which the tether is fed out will gradually decrease through the rest of the procedure, coming to a stop almost five and a half hours after the initial movement, when the satellite is a little more than 12.8 miles, or 20.7 kilometers, from Columbia.

Just prior to the satellite's arrival at its most distant point, the quarter-revolution spin will be stopped briefly to measure tether dynamics. Then, a seven-tenths-of-a-revolution-per-minute spin will be imparted. At full deploy, the tension on the tether, or the pull from the satellite, is predicted to be equivalent to about 12 pounds of force.

The tether is 13.7 miles, or 22 kilometers, long, allowing an extra mile, or1.3 kilometers, of spare tether that is not planned to be unwound during the mission.

Dynamics Functional Objectives

During the deploy of TSS, several tests will be conducted to explore control and dynamics of a tethered satellite. Models of deployment have shown that the longer the tether becomes, the more stable the system will be. The dynamics and control tests that will be conducted during deploy also will aid in preparing for retrieval of the satellite and will serve to verify the ability to control the satellite during that operation.

During retrieval, it is expected that the stability of the system will decrease as the tether is shortened, opposite the way stability increased as the tether was lengthened during deploy. The dynamics tests involve maintaining a constant tension on the tether and correcting any of several possible disturbances to it.

The possible disturbances include: a bobbing motion, also called a plumb bob, where the satellite bounces slightly on the tether, causing it to alternately slacken and tighten; an oscillation of the tether, called a libration, resulting in a pendulum-like movement of tether and satellite; a pendulous motion of the satellite, rolling and pitching motion of the satellite at the end of the tether; and a lateral string mode disturbance, a motion where the satellite and Shuttle are stable, but the tether is moving back and forth in a "skip rope" motion.

All of these disturbances may occur naturally and are not unexpected. Some disturbances will be intentionally induced. The first test objective will be

performed when the satellite is 250 yards from Columbia, and will involve small firings of the satellite's steering jets to test the response of the satellite's automatic rate damping system.

Other methods of controlling the satellite and tether motion can be performed by the crew when needed. Those methods include using visual contact with the satellite or telemetry information from it to manually stabilize TSS from aboard the Shuttle by remotely firing the satellite's attitude thrusters.

Another test will be performed when the satellite is about 2.5 miles from Columbia. Columbia's autopilot will be adjusted to allow the Shuttle to drift by as much as 10 degrees in any direction before steering jets automatically fire to maintain Columbia's orientation. The 10-degree deadband will be used to judge any disturbances that may be imparted to the satellite if a looser attitude control is maintained by Columbia. The standard deadband, or degree of allowable drift, set in the Shuttle's digital autopilot for Tethered Satellite operations is two degrees of drift. Tests using the wider deadband will allow the crew and flight controllers to monitor the amount of motion the satellite and tether impart to Columbia.

When the satellite is fully deployed and on station at 12.8 miles, Columbia will perform jet firings to judge disturbances imparted to the tether and satellite at that distance. The satellite is planned to remain at that distance, called On Station-1 (OST-1), for about 22 hours. Damping of any motion which is expected to occur in the tether and satellite while at 12.8 miles and during the early portion of retrieval will be accomplished using electrical current flow through the tether. During the later stages of retrieval, damping will be accomplished using a combination of the Shuttle's steering jets, a built-in damping system at the end of the deploy boom and the satellite's steering jets.

Retrieval Operations

Retrieval operations of the satellite will occur more slowly than deployment. The rate of retrieval of the tether, the closing rate between Columbia and the satellite, will build after five hours since its initial movement to a peak rate of about three miles per hour. At that point, when the satellite is about four and a half miles from Columbia, the rate of retrieval will gradually decrease, coming to a halt about five and a half hours after the start of retrieval operations when the satellite is approximately 1.5 miles from Columbia. The satellite will remain at 1.5 miles from Columbia for seven to nine hours of science operations before the final retrieval begins.

The final phase of retrieval is expected to take about two hours. A peak closing rate of closing between Columbia and the satellite of about 1.5 miles per hour will be attained just after the final retrieval begins, and the closing rate will gradually decrease through the remainder of the operation. The closing rate at the time the satellite is docked to the cradle at the end of the deployer boom is planned to be less than one-tenth of one mile per hour.

United States Microgravity Payload-3 (USMP-3)

USMP-3 Science

Once on orbit, crew members will activate the USMP-3 experiment hardware, while science teams in the Science Operations Area of Marshall's Spacelab Mission Operations Control watch preliminary data, awaiting their turn as primary payload following TSS operations. Science teams will monitor and adjust experiments as necessary, based on data downlinked from Columbia.

Cargo Bay Experiments

Advanced Automated Directional Solidification Furnace (AADSF)
• Principal Investigator: Dr. Archibald L. Fripp, NASA Langley Research Center, Langley, VA

Objective. The speed and the amount of information that can be stored and sent by computers and high-tech electronics, using sophisticated semiconductor materials, may be increased by better control of how the semiconductor's structure forms. Millions of dollars are invested each year in ground-based research to reach this goal. The Advanced Automated Directional Solidification Furnace (AADSF) will fly again on USMP-3 to expand upon findings from USMP-2 to help researchers develop processes and materials that perform better and cost less to produce.

A semiconductor's usefulness is determined by how atoms are ordered within the crystal's underlying three-dimensional structure. These materials, when produced under the influence of gravity, often suffer structural damage that limits the crystal's usefulness. A warm fluid is less dense than a cooler sample of the same fluid, and on Earth, gravity causes the cooler, denser material to sink while the warmer fluid rises. Flows caused by this process, known as buoyancy-induced convection, as well as another undesirable phenomenon — sedimentation — are greatly reduced in the Shuttle's orbiting microgravity laboratory. The effects of gravity on the orbiting spacecraft are roughly a million times less than experienced on the ground.

Procedure. During USMP-3, the AADSF will be used to grow a crystal of lead-tin-telluride (PbSnTe), a material used to make infrared radiation detectors and lasers. This will be done by the technique known as directional solidification. This method involves cooling a molten material, causing a solid to form at one end of the sample. The solidification region grows at the point where the solid and liquid meet, known as the solid/liquid interface. This interface is moved from one end of the sample to the other at a controlled rate, resulting in a high degree of crystalline perfection.

The facility has multiple temperature zones, ranging from extremely hot — above the melting point of the material (about 1600 degrees Fahrenheit/870 Celsius) — to cooler zones below the melting point (about 650 degrees

Fahrenheit/340 Celsius). Once a region of the crystal is melted, the sample is slowly moved and directional solidification takes place.

The solid/liquid interface is where the flows in the molten material influence the final composition and structure of the crystal sample. After the mission, scientists will analyze the solidified sample to determine the density of defects and the distribution of elements in the crystal.

Critical Fluid Light Scattering Experiment (Zeno)
• Principal Investigator: Dr. Robert Gammon, Institute for Physical Science and Technology, University of Maryland, College Park, MD

Objective. The Zeno investigation, named for the Greek philosopher, will explore an unusual state of matter by measuring the density of the element xenon at its critical point, a unique set of conditions when it is literally on the edge of simultaneously being in a gaseous phase and a liquid phase. More precisely, the material rapidly changes back and forth from one state to the other so that one is unable to determine the state of a given volume of material.

Scientists are interested in what happens at the critical point because these phase change phenomena are common to many different materials. Understanding how matter behaves at the critical point can provide insight into a variety of physics problems, ranging from state changes in fluids (gas to liquid) to alterations in the magnetic properties of solids. This knowledge will be valuable in a wide variety of fields, including liquid crystals, superconductors and even matter fluctuations in the early formation of the universe.

Procedure. Aboard the Shuttle, Zeno will measure properties of xenon a hundred times closer to its critical point than is possible on Earth. USMP-3 will use a refined procedure for approaching the critical point temperature more slowly, gradually scanning from one temperature to the next, taking advantage of the Zeno instrument's sensitivity to minute variations in fluid density that arise in microgravity. This will be done by shining laser light on a xenon sample and analyzing the resulting light scattering. At controlled temperatures extremely near the critical temperature, the fluid will be a billion times more compressible than water but will have similar density. It will change from a vapor clear as glass to a milky white fluid with a large capacity for absorbing heat, but will transport heat very slowly. Accurate measurements of a fluid's physical properties when very close to the critical point cannot be made on Earth because gravity causes the fluid to layer, with respect to density, (vapor on top, liquid below) severely at the temperatures of most significance. The orbital environment will permit measurements to be made within a few millionths of a degree of the critical temperature.

The Zeno instrument is contained within two flight modules to isolate electrical noise sources and thermal loads from the most sensitive optical and electronic subsystems in the light-scattering instrument. A precision, high-pressure sample cell will hold the xenon sample with a 100-micron-thick fluid layer for the light-scattering experiment. This cell and a compact, high-

performance thermostat are the key elements in making precision measurements. The main components of the light-scattering system are housed on an optics bench.

Isothermal Dendritic Growth Experiment (IDGE)
• Principal Investigator: Dr. Martin Glicksman, Rennselaer Polytechnic Institute, Troy, NY

Objective. Metals manufacturing for many industrial and consumer products involves the process of solidification. Industrial materials research traditionally has tried many different things instead of developing a clear understanding of the fundamental processes involved. Microgravity research such as this will lead to manufacturing improvements in metals and alloys that display dendrite formation.

As most molten materials solidify, they form tiny pine tree-shaped crystals called dendrites, from the ancient Greek for "tree." The size, shape and direction of these crystals dictate the final properties of the resulting solid material, such as its hardness, its ability to bend without breaking and its electrical properties. On USMP-2, dendrite researchers were able to observe dendrites in the absence of convection at extremely small temperature differences below the freezing point, a phenomenon never seen on Earth. During USMP-3, the experiment will continue to build upon that foundation.

Procedure. The Isothermal Dendritic Growth Experiment apparatus consists of a thermostat that contains the dendrite growth chamber. The growth chamber will be filled with ultra pure succinonitrile (SCN), a substance that mimics the behavior of metals, but is transparent, thus allowing the dendrites to be easily photographed. Dendrite growth begins by cooling a tube, known as a stinger, which is filled with the liquid and extends into the growth chamber. This causes the SCN to solidify, with a solidification front moving down the tube to the tip of the stinger and emerging into the SCN volume as an individual dendrite.

Two television cameras will allow scientists to watch for dendrites to emerge. The images of dendrites growing in space will be viewed in near-real-time by scientists on the ground. When the experiment computer detects dendrites, it will trigger two 35-millimeter cameras to photograph the samples. Researchers will compare photographs of the space-grown dendrites to evaluate growth rate and dendrite shape.

Materials for the Study of Interesting Phenomena of Solidification on Earth and in Orbit (MEPHISTO)
• Principal Investigator: Dr. J.J. Favier, Center for Nuclear Study, Grenoble, France

Objective. The investigation known as MEPHISTO is a cooperative program between NASA, the French Space Agency and the French Atomic Energy Commission, with the goal of understanding how gravity-driven convection affects the production of metals, alloys and electronic materials. MEPHISTO flew on both previous USMP missions. Analyses of samples produced on orbit are being conducted by science and technical teams to improve processes for making products ranging from alloys for airplane turbine blades to electronic materials. This third flight of MEPHISTO will continue the investigation into how material solidifies in microgravity. Ultimately, the MEPHISTO experiments may bring dramatic improvements in materials production.

Researchers want to know what happens at the boundary between solid and liquid — the solid/liquid interface — during solidification of a molten material, to better control this process on Earth. Temperature differences at this boundary can cause fluid movements that affect the structure and properties of the solidified product through convection and sedimentation. In microgravity, sedimentation and buoyancy-induced convection are greatly reduced, so researchers can explore underlying processes that normally are masked by gravity.

Procedure. The MEPHISTO furnace aboard USMP-3 will repeatedly process three samples of a tin-bismuth alloy using directional solidification, a common method for growing crystalline materials such as metals and semiconductors. As the solidified region grows, the boundary between the solid and liquid material will move from one end of the sample toward the other. Electrical measurements will gauge temperature variations in the solidification front. These temperature variations are indicative of the stability of the interface which is very important in controlling the properties of the material in its solid state. The shape of the front will be marked in the growing crystal by subjecting the sample to electric-current pulses.

Researchers will compare results produced on orbit with those produced on the ground to better understand and expand theories of materials, materials processing and the potential that the microgravity environment offers for research in areas with down-to-Earth applications.

Measuring the Microgravity Environment of the Orbiting Shuttle

Space Acceleration Measurement Systems (SAMS)
• Project Scientist: Richard DeLombard, NASA Lewis Research Center, Cleveland, OH

Objective. When the Space Shuttle is in orbit, the effects of gravity are reduced by close to one million times. However, disturbances happen when crew members move about and equipment is operated, as well as when the Shuttle maneuvers by firing thrusters and even when it experiences subtle atmospheric drag. USMP-3 scientists will depend on measurements of minute changes in the orbital environment to tweak their experiments and improve

scientific data collection, as well as to determine how such vibrations or accelerations influence experiment results. Future mission designs also will benefit from Space Acceleration Measurement System data.

Procedure. The system accurately measures the orbital environment via five sensors, called "accelerometers," placed throughout the Shuttle. Microgravity profiles are transmitted to the ground through the Shuttle's communications system. These data also are recorded on optical disks for post-flight analysis.

Orbital Acceleration Research Experiment (OARE)
• Project Scientist: Richard DeLombard, NASA Lewis Research Center, Cleveland, OH

Objective. In the past, the Orbital Acceleration Research Experiment has helped scientists obtain data to make the best possible use of the low-gravity environment. While the orbiting Shuttle offers a remarkably stable ride for space-based experiments, it does experience some low-level disturbances from the Shuttle's orientation, atmospheric drag and venting of liquids or gases, among others. USMP-3 experiments will use this acceleration data to complement the data provided by the Space Acceleration Measurement System and improve research results.

Procedure. The heart of the OARE instrument is a miniature electrostatic accelerometer that accurately measures low-frequency on-orbit acceleration disturbances. The Shuttle's flight attitude can be changed to satisfy the needs of any particular experiment based on information measured, processed, stored and downlinked in near real-time.

Middeck Glovebox Facility (MGBX) Combustion Investigations
• MGBX Project Scientist: Dr. Donald Reiss, NASA Marshall Space Flight Center, Huntsville, AL

Three combustion investigations will be conducted in the Middeck Glovebox Facility. The glovebox facility is a contained space where potentially hazardous materials can be handled and crew members can perform operations that are impractical in the open cabin environment. This glovebox was developed to provide such capabilities in the Shuttle middeck and for future use on the international Space Station. The facility provides power, air and particle filtration, light, data collection, real-time monitoring, and sensors for gas, temperature, air pressure and humidity. For each experiment, a crew member will remove the experiment kit from stowage and place it through the glovebox door, then tightly seal the opening. Using gloves that project into the facility, a crew member will set up the experiment and conduct it in this safe enclosure.

Forced-Flow Flamespreading Test (FFFT)
• Investigator: Kurt R. Sacksteder, NASA Lewis Research Center, Cleveland, OH

Objective. On Earth, gravity causes air motion known as buoyant convection — the rising of hot air and falling of cool air. Scientists who study combustion

want to know the details of how air motion affects flame spreading, to be able to better control fires that may occur on orbit. When a fire starts on Earth, flames spread due to the movement of air around and through the flames. Air motion provides oxygen for the chemical reactions in the flame, removes combustion products (some toxic), and controls how the heat released in the flame is distributed.

Procedure. A crew member will place small solid fuel samples (flat paper and cellulose cylinders) into the test module; seal the module in the Middeck Glovebox; establish air flow; heat, then ignite the fuel sample; and record the results on video and film for later study. Gas samples will be extracted from the combustion products. Researchers on the ground will watch downlinked video of the flame and temperature displays to analyze early results and possibly change subsequent test runs.

Radiative Ignition and Transition to Spread Investigation (RITSI)
Investigator: Dr. Takashi Kashiwagi, National Institute for Standards and Testing, Gaithersburg, MD

Objective. Fires in spacecraft pose a significant threat. A short-circuit in an electrical system or overheated electrical components could ignite flammable material. Toxic gases can quickly poison the air, and fire extinguishers can damage critical equipment. To prevent and control fires on orbit, the conditions that lead up to ignition must be understood.

Procedure. The experiment apparatus consists of a flow duct with screens at both ends and a fan that pulls air through the duct. The clear lid of the duct opens for access to the sample holder to change out samples of ashless filter paper. A high-intensity lamp will be focused on the sample to preheat and then ignite it. The crew member will use a small control box attached to the outside of the glovebox to perform the experiment. During operations, Dr. Kashiwagi's team will monitor the experiment. Between tests, downlinked data will be analyzed to recommend conditions for subsequent tests.

Comparative Soot Diagnostics (CSD)
• Investigator: Dr. David L. Urban, NASA Lewis Research Center, Cleveland, OH

Objective. An understanding of soot processes in flames produced in microgravity will contribute to our ability to predict fire behavior on Earth. However, no soot measurements have been made of quasi-steady, microgravity flames. The Comparative Soot Diagnostics experiment will provide the first such measurements and will provide data useful for understanding soot processes on Earth. Since fire detector systems currently flown on the Shuttle and scheduled for use on the international Space Station have not been tested for quasi-steady, low-gravity sources of minute particles, this data will be studied for its applicability to the design and operation of future spacecraft smoke detection systems.

Procedure. The experiment will examine particle formation from a variety of sources, including a candle and four overheated materials — paper, silicone rubber, and wires coated with Teflon™ and Kapton™. These materials are found in crew cabins, and silicone rubber is an industrial product. The apparatus consists of two modules, one installed inside the glovebox and the other attached to the outside of the glovebox. After running a self-diagnostic procedure on the smoke detectors in the internal module, the crew member performing this experiment will activate a video camera and turn on an igniter. A probe will sample the soot when flames are well developed.

Commercial Protein Crystal Growth (CPCG)

STS-75 includes a flight of the Commercial Protein Crystal Growth systems identified as CPCG-09. This payload will process nine different proteins seeking the development of new therapeutic treatments for infections, human cancers, diseases caused from hormone disorders, and Chagas disease.

Columbia will carry into space the first joint U.S.-Latin American experiment in protein crystal growth. The project, conceived in March 1993, brings together a small team of investigators from Costa Rica, Chile and the United States. It involves the crystallization in microgravity of ultrapure samples of Tripanothione Reductase, a DNA-grown protein expressing key features of the Tripanosoma Cruzi, the parasite that causes Chagas Disease. The experiment will seek to determine the structure of this protein through crystallographic studies of the crystals obtained in space. The high resolution resulting from the space grown crystals could pave the way for the development of effective pharmaceuticals to combat this debilitating disease and lead, some day, to an effective vaccine.

The CPCG-09 payload was developed by the CMC, which was formed in 1985 as a NASA Center for the Commercial Development of Space. The CMC's objective is to form partnerships with industrial groups and other government agencies who are pursuing commercial applications of macromolecular crystallography relating to structure-based drug design. This is a drug discovery methodology based on inhibiting or enhancing the biological activity of macromolecules, or proteins, responsible for various diseases. Protein crystallography, using X-ray diffraction, is the lead technique whereby the three-dimensional molecular structure of a protein disease target is established. Protein structural information leads to the discovery and synthesis of complementary compounds that can become potent drugs specifically directed against the disease target. Structure-based drug design is a productive and cost-effective targeted drug development strategy.

CPCG-09 will be the CMC's 29th space flight, and will use the CMC's newly developed Commercial Vapor Diffusion Apparatus (CVDA). Analysis of the results of previous CMC missions has shown that techniques have produced proteins crystals of significantly higher quality than ever grown on Earth before. The CMC has developed over ten pieces of flight hardware specifically for the support of microgravity investigations in protein crystal growth. These systems use vapor diffusion, temperature induction, and batch mixing techniques and certain pieces of hardware have been augmented with instrumentation for localized temperature, light scattering, and video monitoring. The newest addition to the crystal growth hardware inventory, the Commercial Vapor Diffusion Apparatus (CVDA), was designed, developed, and manufactured by the CMC. The CVDA can accommodate 128 protein samples. The flight of CPCG-09 is sponsored by the Space Processing Division of the Office of Space Access and Technology, as part of NASA's commercial development of space program.

STS-75 CREW BIOGRAPHIES

NAME: Andrew M. Allen (Lieutenant Colonel, USMC)
NASA Astronaut

BIRTHPLACE AND DATE: Born August 4, 1955, in Philadelphia, PA. His father, Charles A. Allen, resides in Richboro, PA. His mother, Loretta T. Allen, is deceased.

EDUCATION: Graduated from Archbishop Wood High School, Warminster, PA, in 1973; received a bachelor of science degree in mechanical engineering from Villanova University in 1977.

CHILDREN: Jessica Marie, July 19, 1985; Meredith Frances, January 9, 1990.

SPECIAL HONORS: Recipient of the Defense Superior Service Medal, the Single Mission Air Medal, the NASA Exceptional Service Medal, the NASA Space Flight Medal, and an honorary Doctorate of Public Service from Bucks County Community College (PA) in 1993.

EXPERIENCE: Allen was a member of the Navy ROTC unit and received his commission in the United States Marine Corps at Villanova University in 1977. Following graduation from flight school, he flew F-4 Phantoms from 1980 to 1983 with VMFA-312 at Marine Corps Air Station (MCAS) Beaufort, SC, and was assigned as the Aircraft Maintenance Officer. He was selected by Headquarters Marine Corps for fleet introduction of the F/A-18 Hornet, and was assigned to VMFA-531 in MCAS El Toro, California, from 1983 to 1986. During his stay in VMFA-531,he was assigned as the squadron Operations Officer, and also attended and graduated from the Marine Weapons & Tactics Instructor Course, and the Naval Fighter Weapons School (Top Gun). A 1987 graduate of the United States Navy Test Pilot School at Patuxent River, MD, he was a test pilot under instruction when advised of his selection to the astronaut program.

He has logged over 4,500 flight hours in more than 30 different aircraft.

NASA EXPERIENCE: Selected by NASA in June 1987, Allen became an astronaut in August 1988. His technical assignments have included: Astronaut Office representative for all Space Shuttle issues related to landing sites, landing and deceleration hardware, including improvements to nosewheel steering, brakes and tires, and drag chute design; Shuttle Avionics Integration Laboratory (SAIL), which oversees, checks, and verifies all Shuttle flight control software and avionics programs; served as Technical Assistant to the Flight Crew Operations Director who is responsible for and manages all flight crew operations and support; was the lead of the Astronaut Support Personnel team which oversee Shuttle test, checkout, and preparation at Kennedy Space

Center; served as Special Assistant to the Director of the Johnson Space Center in Houston, Texas; was lead of a Functional Workforce Review at the Kennedy Space Center, Florida, to determine minimal workforce and management structure requirements which allow maximum budget reductions while safely continuing Shuttle Flight Operations. A veteran of two space flights, Allen has logged over 526 hours in space. He was the pilot on STS-46 in 1992, and STS-62 in 1994. Allen is assigned to command the STS-75 mission, a 13-day flight scheduled for launch in early 1996.

NAME: Scott J. "Doc" Horowitz, Ph.D. (Lieutenant Colonel, USAF)
NASA Astronaut

BIRTHPLACE AND DATE: Born March 24, 1957, in Philadelphia, PA, but considers Thousand Oaks, CA, to be his hometown. His father, Seymour B. Horowitz, resides in Thousand Oaks, CA. His mother, Iris D. Chester, resides in Santa Monica, CA.

EDUCATION: Graduated from Newbury Park High School, Newbury Park, CA, in 1974; received a bachelor of science degree in engineering from California State University at Northridge in 1978; a master of science degree in aerospace engineering from Georgia Institute of Technology in 1979; and a doctorate in aerospace engineering from Georgia Institute of Technology in 1982.

MARITAL STATUS: Married to the former Lisa Marie Kern. Her parents, Frank and Joan Ecker, reside in Briarwood, NY.

SPECIAL HONORS: USAF Test Pilot School Class 90A Distinguished Graduate (1990); Combat Readiness Medal (1989); Air Force Commendation Medals (1987, 1989); F-15 Pilot, 22TFS, Hughes Trophy (1988); F-15 Pilot, 22TFS, CINCUSAFE Trophy; Mission Ready in the F-15 Eagle at Bitburg Air Base (1987); Systems Command Quarterly Scientific & Engineering Technical Achievement Award (1986); Master T-38 Instructor Pilot (1986); Daedalean (1986); 82nd Flying Training Wing Rated Officer of the Quarter (1986); Outstanding Young Men In America (1985); Outstanding T-38 Instructor Pilot (1985); Outstanding Doctoral Research Award for 1981-82 (1982); Sigma Xi Scientific Research Society (1980); Tau Beta Pi Engineering Honor Society (1978); 1st Place ASME Design Competition.

EXPERIENCE: Following graduation from Georgia Tech in 1982, Scott worked as an associate scientist for the Lockheed-Georgia Company, Marietta, GA, where he performed background studies and analyses for experiments related to aerospace technology to validate advanced scientific concepts. In 1983, he graduated from Undergraduate Pilot Training at Williams Air Force Base, AZ. From 1984 to 1987, he flew as a T-38 instructor pilot and performed research and development for the Human Resources Laboratory at Williams Air Force Base. The following two years were spent as an operational F-15 Eagle Fighter Pilot in the 22nd Tactical Fighter Squadron stationed at Bitburg Air Base in Germany. In 1990, Scott attended the United States Air Force Test Pilot School at Edwards Air Force Base, CA, and was subsequently assigned as a test

pilot flying A-7s and T-38s for the 6512th Test Squadron at Edwards. Additionally, from 1985 to 1989, Scott served as an adjunct professor at Embry Riddle University where he conducted graduate level courses in aircraft design, aircraft propulsion and rocket propulsion. In 1991, as a professor for California State University, Fresno, he conducted graduate level courses in mechanical engineering including advanced stability and control.

NASA EXPERIENCE: Selected by NASA in March 1992, Scott reported to the Johnson Space Center in August 1992. He completed one year of training and is qualified for selection as a pilot on Space Shuttle flight crews. Scott is currently working technical issues for the Operations Development Branch of the Astronaut Office.

NAME: Jeffrey A. Hoffman (Ph.D.)
NASA Astronaut

BIRTHPLACE AND DATE: Born November 2, 1944, in Brooklyn, New York, but considers Scarsdale, New York, to be his hometown. His parents, Dr. and Mrs. Burton P. Hoffman, are residents of White Plains, New York.

EDUCATION: Graduated from Scarsdale High School, Scarsdale, New York, in 1962; received a bachelor of arts degree in astronomy (graduated summa cum laude) from Amherst College in 1966, a doctor of philosophy in astrophysics from Harvard University in 1971, and a masters degree in materials science from Rice University in 1988.

MARITAL STATUS: Married to the former Barbara Catherine Attridge of Greenwich, London, England. Her father, Mr. Frederick J. C. Attridge, resides in Kidbrooke, London, England.

CHILDREN: Samuel L., May 3, 1975; Orin P. F., April 30, 1979.

SPECIAL HONORS: Awarded the Amherst College 1963 Porter Prize in Astronomy, 1964 Second Walker Prize in Mathematics, 1965 John Summer Runnells Scholarship Prize, and 1966 Stanley V. and Charles B. Travis Prize and Woods Prize for Scholarship. Elected to Phi Beta Kappa in 1965 and Sigma Xi in 1966. Also received a Woodrow Wilson Foundation Pre-Doctoral Fellowship, 1966-67; a National Science Foundation Pre-Doctoral Fellowship, 1966-71; a National Academy of Sciences Post-Doctoral Visiting Fellowship, 1971-72; a Harvard University Sheldon International Fellowship, 1972-73; and a NATO Post-Doctoral Fellowship, 1973-74. Dr. Hoffman was awarded NASA Space Flight Medals in 1985, 1991, 1992 and 1994, NASA Exceptional Service Medals in 1988 and 1992, and the NASA Distinguished Service Medal in 1994.

EXPERIENCE: Dr. Hoffman's original research interests were in high-energy astrophysics, specifically cosmic gamma ray and x-ray astronomy. His doctoral work at Harvard was the design, construction, testing, and flight of a balloon-borne, low-energy, gamma ray telescope.

From 1972 to 1975, during 3 years of post-doctoral work at Leicester University, he worked on three rocket payloads, two for the observation of lunar occultations of x-ray sources and one for an observation of the Crab Nebula with a solid state detector and concentrating x-ray mirror. He designed and supervised the construction and testing of the lunar occultation payloads and designed test equipment for use in an x-ray beam facility which he used to measure the scattering and reflectivity properties of the concentrating mirror. During his last year at Leicester, he was project scientist for the medium-energy x-ray experiment on the European Space Agency's EXOSAT satellite and played a leading role in the proposal and design studies for this project.

He worked in the Center for Space Research at the Massachusetts Institute of Technology (MIT) from 1975 to 1978 as project scientist in charge of the orbiting HEAO-1 A4 hard x-ray and gamma ray experiment, launched in August 1977. His involvement included pre-launch design of the data analysis system, supervising its operation post-launch, and directing the MIT team undertaking the scientific analysis of flight data being returned. He was also involved extensively in analysis of x-ray data from the SAS-3 satellite being operated by MIT, performing research on the study of x-ray bursts. Dr.Hoffman has authored or co-authored more than 20 papers on this subject since bursts were first discovered in 1976.

NASA EXPERIENCE: Selected by NASA in January 1978, Dr. Hoffman became an astronaut in August 1979. During preparations for the Shuttle Orbital Flight Tests, Dr. Hoffman worked in the Flight Simulation Laboratory at Downey, California, testing guidance, navigation and flight control systems. He has worked with the orbital maneuvering and reaction control systems, with Shuttle navigation, with crew training, and with the development of satellite deployment procedures. Dr. Hoffman served as a support crew member for STS-5 and as a CAPCOM (spacecraft communicator) for STS-8. Dr. Hoffman has been the Astronaut Office Payload Safety Representative. He has also worked on EVA, including the development of a high-pressure spacesuit for use on the Space Station. Dr. Hoffman is a member of the Astronaut Office Science Support Group.

Dr. Hoffman made his first space flight as a mission specialist on STS 51-D, April 12-19, 1985, on the Shuttle Discovery. On this mission, he made the first STS contingency space walk, in an attempted rescue of a malfunctioning satellite.

Dr. Hoffman made his second space flight as a mission specialist on STS-35, December 2-10, 1990, on the Shuttle Columbia. This Spacelab mission featured the ASTRO-1 ultraviolet astronomy laboratory, a project on which Dr. Hoffman had worked since 1982.

Dr. Hoffman made his third space flight as payload commander and mission specialist on STS-46, July 31-August 8, 1992, on the Shuttle Atlantis. On this mission, the crew deployed the European Retrievable Carrier (EURECA), an

ESA-sponsored free-flying science platform, and carried out the first test flight of the Tethered Satellite System (TSS), a joint project between NASA and the Italian Space Agency. Dr. Hoffman had worked on the Tethered Satellite project since 1987.

Dr. Hoffman made his fourth flight as an EVA crew member on STS-61, December 2-13, 1993, on the Shuttle Endeavour. During this flight, the Hubble Space Telescope (HST) was captured, serviced, and restored to full capacity through a record five space walks by four astronauts.

With the completion of his fourth space flight, Dr. Hoffman has logged more than 834 hours and 15 million miles in space.

NAME: Maurizio Cheli
ESA Astronaut

BIRTHPLACE AND DATE: Born May 4, 1959, in Modena, Italy. His parents, Araldo and Eulalia Cheli, reside in Zocca (Modena), Italy.

EDUCATION: Graduated from the Italian Air Force Academy in 1982. Studied geophysics at University of Rome in 1989. He received a master of science in Aerospace Engineering from the University of Houston.

MARITAL STATUS: Married to the former Marianne Merchez. Her parents, Marcel and Annie Merchez, reside in Brussels, Belgium.

SPECIAL HONORS: Top graduate, Italian Air Force War College (1987); top graduate, Empire Test Pilot School, Boscombe Down, United Kingdom (1988).

EXPERIENCE: After graduation from the Italian Air Force Academy, Cheli underwent pilot training at Vance Air Force Base, Oklahoma, in 1982-1983. Following fighter lead-in training at Holloman Air Force Base, New Mexico and initial training in the F-104G in Italy, he joined the 28th Sqaudron, 3rd Recce Wing in 1984. In 1987, he attended the Italian Air Force War College and in 1988 he graduated from the Empire Test Pilot's School, Boscombe Down, United Kingdom. While assigned to the Italian Air Force Flight Test Center in Pratica di Mare, Rome, he served as a Tornado and B-707 Tanker project pilot on a variety of test programs. His flight experience includes over 3,000 flying hours in over 50 different types of fixed wing aircraft and helicopters. In June 1992, he was selected by the European Space Agency for astronaut training.

Cheli holds a commission as Lieutenant Colonel in the Italian Air Force.

NASA EXPERIENCE: Cheli reported to the Johnson Space Center in August 1992 and completed one year of training in August 1993. He is qualified for assignment as a mission specialist on future Space Shuttle flight crews. His technical assignments to date include: flight software verification in the Shuttle

Avionics Integration Laboratory (SAIL); remote manipulator system/robotics; crew equipment.

NAME: Claude Nicollier
ESA Astronaut

BIRTHPLACE AND DATE: Born September 2, 1944, in Vevey, Switzerland. His father, Mr. Georges Nicollier, resides in La Tour de Peilz, Switzerland.

EDUCATION: Graduated from Gymnase de Lausanne (high school), Lausanne, Switzerland, in 1962; received a bachelor of science in physics from the University of Lausanne in 1970 and a master of science degree in astrophysics from the University of Geneva in 1975. Also graduated as a Swiss Air Force pilot in 1966, an airline pilot in 1974, and a test pilot in 1988.

MARITAL STATUS: Married to the former Susana Perez of Monterrey, Mexico. Her parents, Mr. and Mrs. Jose L. Perez, reside in Guadalajara, Mexico.

CHILDREN: Maya, July 19, 1974; and Marina, June 15, 1978.

SPECIAL HONORS: Two NASA Space Flight Medals (1992 & 1993), Prix d'honneur de la Fondation Pro Aero, Switzerland (1992), Yuri Gagarin Gold Medal from the International Aeronautical Federation (1994), Silver Medal from the Académie Nationale de l'Air et de l'Espace, France (1994), Collier Trophy (awarded to the crew of STS-61) from the National Aeronautics Association (1994), Prix de l'Université de Lausanne (1994), honorary doctorates from the Swiss Federal Institute of Technology, Lausanne, and the Geneva University (both in 1994). Appointed professor at the Swiss Federal Institute of Technology, Lausanne, in November 1994.

EXPERIENCE: From 1970 to 1973, Claude worked as a graduate scientist with the Institute of Astronomy at Lausanne University and at the Geneva Observatory. He then joined the Swiss Air Transport School in Zurich and was assigned as a DC-9 pilot for Swissair, concurrently participating part-time in research activities of the Geneva Observatory. At the end of 1976 he accepted a Fellowship at the European Space Agency's (ESA) Space Science Department at Noordwijk, Netherlands, where he worked as a research scientist in various airborne infrared astronomy programs. In July 1978 he was selected by ESA as a member of the first group of European astronauts. Under agreement between ESA and NASA he joined the NASA astronaut candidates selected in May 1980 for astronaut training as a mission specialist.

His technical assignments in the Astronaut Office have included flight software verification in the Shuttle Avionics Integration Laboratory (SAIL), participation in the development of retrieval techniques for the Tethered Satellite System (TSS), Remote Manipulator System(RMS), and International Space Station (ISS) robotics support. During 1988 he attended the Empire Test

Pilot School in Boscombe Down, England, from where he graduated as a test pilot in December 1988.

Claude holds a commission as captain in the Swiss Air Force and, during leave periods in Switzerland, maintains proficiency in the Northrop F-5E aircraft. He has logged 5,300 hours flying time--including 3,700 hours in jet aircraft.

A veteran of two space flights, Claude has logged more than 451 hours in space. He flew on STS-46 in 1992, and STS-61 in 1993.

NAME: Franklin R. Chang-Díaz (Ph.D.)
NASA Astronaut

BIRTHPLACE AND DATE: Born April 5, 1950, in San José, Costa Rica, to the late Mr. Ramón A. Chang-Morales and Mrs. María Eugenia Díaz De Chang. His mother resides in Costa Rica.

EDUCATION: Graduated from Colegio De La Salle in San José, Costa Rica, in November 1967, and from Hartford High School in Hartford, CT, in 1969; received a bachelor of science degree in mechanical engineering from the University of Connecticut in 1973 and a doctorate in applied plasma physics from the Massachusetts Institute of Technology (MIT) in 1977.

MARITAL STATUS: Married to the former Peggy Marguerite Doncaster of Alexandria, LA.

CHILDREN: Jean E., December 22, 1973; Sonia R., March 31, 1978; Lidia A., March 1, 1988; and Miranda K., July 9, 1995.

SPECIAL HONORS: Recipient of the University of Connecticut's Outstanding Alumni Award (1980); NASA Space Flight Medal (1986); the Liberty Medal from President Ronald Reagan at the Statue of Liberty Centennial Celebration in New York City (1986); the Medal of Excellence from the Congressional Hispanic Caucus (1987); NASA Exceptional Service Medals (1988, 1990, 1993); American Astronautical Society Flight Achievement Award (1989); NASA Space Flight Medals (1986, 1989, 1992, 1994). Outstanding Technical Contribution Award, Hispanic Engineer National Achievement Awards Conference (1993). Awarded the Cross of the Venezuelan Air Force by President Jaime Lusinchi during the 68th Anniversary of the Venezuelan Air Force in Caracas, Venezuela (1988). Recipient of three Honoris Causa Doctorates: Doctor of Science from the Universidad Nacional de Costa Rica; Doctor of Science from the University of Connecticut and Doctor of Law from Babson College. Also Honorary faculty from the College of Engineering of the University of Costa Rica. Honorary Citizenship from the government of Costa Rica (April 1995). This is the highest honor Costa Rica confers to a foreign citizen, making him the first such honoree who was actually born there.

EXPERIENCE: While attending the University of Connecticut, he also worked as a research assistant in the Physics Department and participated in the design and construction of high energy atomic collision experiments. Following graduation in 1973, he entered graduate school at MIT, becoming heavily involved in the United States' controlled fusion program and doing intensive research in the design and operation of fusion reactors. He obtained his doctorate in the field of applied plasma physics and fusion technology and, in that same year, joined the technical staff of the Charles Stark Draper Laboratory. His work at Draper was geared strongly toward the design and integration of control systems for fusion reactor concepts and experimental devices, in both inertial and magnetic confinement fusion. In 1979, he developed a novel concept to guide and target fuel pellets in an inertial fusion reactor chamber. More recently he has been engaged in the design of a new concept in rocket propulsion based on magnetically confined high temperature plasmas. As a visiting scientist with the M.I.T. Plasma Fusion Center from October 1983 to December 1993, he led the plasma propulsion program there to develop this technology for future human missions to Mars. In December 1993, Dr. Chang-Díaz was appointed Director of the Advanced Space Propulsion Laboratory at the Johnson Space Center where he continues his research on plasma rockets. He is an Adjunct Professor of Physics at the University of Houston and has presented numerous papers at technical conferences and in scientific journals.

In addition to his main fields of science and engineering, he worked for 2-1/2 years as a house manager in an experimental community residence for de-institutionalizing chronic mental patients, and was heavily involved as an instructor/advisor with a rehabilitation program for hispanic drug abusers in Massachusetts.

NASA EXPERIENCE: Selected by NASA in May 1980, Dr. Chang-Díaz became an astronaut in August 1981. While undergoing astronaut training he was also involved in flight software checkout at the Shuttle Avionics Integration Laboratory (SAIL), and participated in the early Space Station design studies. In late 1982 he was designated as support crew for the first Spacelab mission and, in November 1983, served as on orbit capsule communicator (CAPCOM) during that flight. From October 1984 to August 1985 he was leader of the astronaut support team at the Kennedy Space Center. His duties included astronaut support during the processing of the various vehicles and payloads, as well as flight crew support during the final phases of the launch countdown. He has logged over 1,800 hours of flight time, including 1,500 hours in jet aircraft.

Dr. Chang-Díaz was instrumental in implementing closer ties between the astronaut corps and the scientific community. In January 1987, he started the Astronaut Science Colloquium Program and later helped form the Astronaut Science Support Group, which he directed until January 1989.

SPACE FLIGHT EXPERIENCE: A veteran of four space flights, Dr. Chang-Díaz has logged over 656 hours in space. He was a crew member on STS 61-C in 1986, STS-34 in 1989, STS-46 in 1992, and STS-60 in 1994.

NAME: Umberto Guidoni (Ph.D.)
Italian Space Agency (ASI) Astronaut, (Payload Specialist)

BIRTHPLACE AND DATE: Born August 18, 1954, in Rome, Italy. His parents, Mr. Pietro Guidoni and Giuseppina Cocco-Guidoni, reside in Rome, Italy.

EDUCATION: Graduated from Classic Liceum "Gaio Lucilio" in Rome, Italy, in 1973; received his BS degree in physics and Ph.D. in Astrophysics (Summa Cum Laude) from University of Rome in 1978.

MARITAL STATUS: Married to Mariarita Bartolacci of Milan, Italy.

CHILDREN: Luca, February 21, 1992.

ORGANIZATION: Member of the Italian Space Society (ISS).

MILITARY STATUS: Reserve Officer of the Italian Air Force.

EXPERIENCE: In 1983, as a staff scientist in the Solar Energy Division of the National Committee for Renewable Energy (ENEA), he was responsible for developing new techniques to characterize solar panels.

In 1984, he became a permanent researcher of the Space Physics Institute (IFSI-CNR) and was involved as co-investigator in the Research on Electrodynamic Tether Effects (RETE) experiment, one of the payloads selected for the Tethered Satellite System (TSS-1). From 1985 to 1988 he designed the Ground Support Equipment (GSE) and supervised the design and testing of the Data Processing Unit (DPU) for the RETE experiment. He also collaborated to the realization of a plasma chamber at IFSI, for laboratory simulations of electrodynamic tether phenomena and for characterization of plasma contactors in ionospheric environment. In 1988, Dr. Guidoni was appointed Project Scientist of RETE. In this capacity he was responsible for the integration of the experiment with the Tethered Satellite System.

In 1989, he was selected by the Italian Space Agency (ASI) to be one of the two Italian scientists to be trained as payload specialists for the TSS-1 mission and joined ASI as a member of the Astronaut Office. In 1991 he was relocated to the NASA Johnson Space Center to follow the training for STS-46/TSS-1 flight.

In 1992, completing his training as Alternate Payload Specialist (APS), Dr. Guidoni supported the STS-46/TSS-1 mission by assisting the Science Team for on-orbit operations at the Payload Operations Control Center (POCC) at the Johnson Space Centerfor the duration of the mission.

Dr. Guidoni is currently assigned as payload specialist on the STS-75, Tethered Satellite System Reflight (TSS-1R) mission, scheduled for launch in February of 1996 aboard Space Shuttle Columbia.

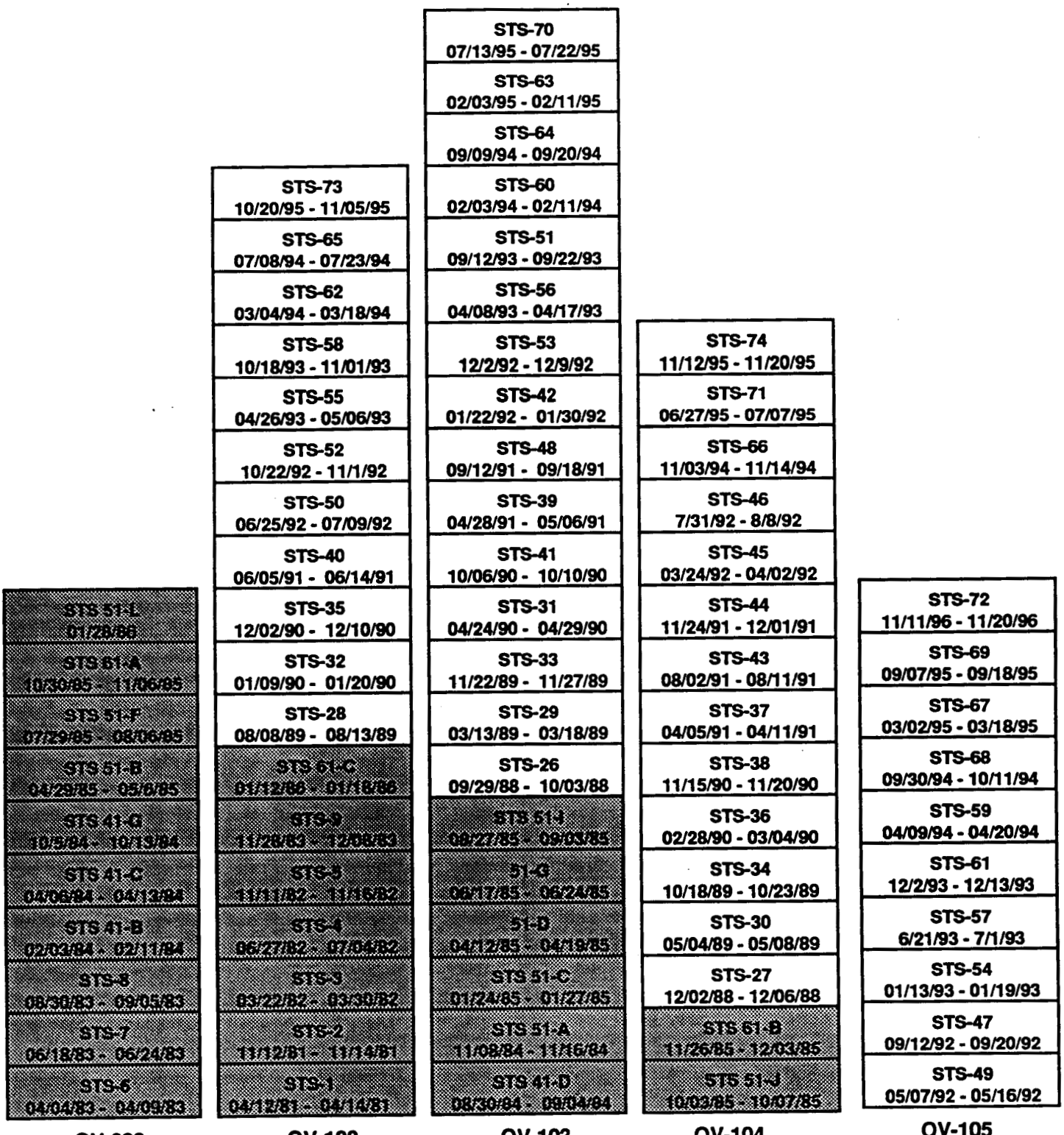
UPCOMING SHUTTLE MISSIONS

MISSION	ORBITER	MAJOR PAYLOADS	TARGET DATE	MISSION DURATION
STS-76	ATLANTIS	Shuttle-Mir Mission-3	MAR. 21, 1996 3:31 a.m. EST	10+1 Days
STS-77	ENDEAVOUR	SPACEHAB-4 SPARTAN-207	MAY 16, 1996 5:32 a.m. EDT	9 Days
STS-78	COLUMBIA	Life & Microgravity Sciences	JUNE 27, 1996 10:49 a.m. EDT	14+2 Days
STS-79	ATLANTIS	Shuttle-Mir Mission-4	AUG. 1, 1996 2:10 a.m. EDT	9+1 Days
STS-80	COLUMBIA	ORFEUS-SPAS WSF	NOV. 7, 1996	16 Days
STS-81	ATLANTIS	Shuttle-Mir Mission-5	DEC. 5, 1996	9+1 Days
STS-82	DISCOVERY	Hubble Space Telescope-Servicing Mission-2	FEB. 13, 1997	10 Days
STS-83	COLUMBIA	Microgravity Science Laboratory-1	MAR. 27. 1997	16 Days
STS-84	ATLANTIS	Shuttle-Mir Mission-6	MAY 1, 1997	9+1 Days

Note: The above information is subject to change. It is based on current assessed target launch dates used as a part of processing and planning activities for upcoming Shuttle missions. The official launch date for a mission is set at the Flight Readiness Review meeting held approximately 2 weeks before launch.

SHUTTLE FLIGHTS AS OF JANUARY 1996

74 TOTAL FLIGHTS OF THE SHUTTLE SYSTEM – 49 SINCE RETURN TO FLIGHT



Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

February 12, 1996

VIDEO ADVISORY: V96-14

WINDOWLESS COCKPIT AND INFRARED CAMERA ON NTV TUESDAY

On Tuesday NASA TV will air footage of flight tests completed on a concept that would take away pilots' windows and replace them with "synthetic vision". This technology could lead to new designs in building future commercial and military aircraft.

NTV also will air a revolutionary infrared camera developed by NASA that may present new possibilities to doctors for detecting tumors, for pilots and environmental scientists monitoring weather patterns and pollution, and enabling military forces to identify various types of rockets by their plumes.

Video News Files air at noon, 3, 6 and 9 p.m. EST

ITEM #1: WINDOWLESS COCKPIT
Footage of how this new technology is used

ITEM #2: INTERVIEW-MICHAEL LEWIS, PROGRAM MANAGER
Lewis discusses the "windowless cockpit"

ITEM #3: INFRARED CAMERA
Footage of the camera

ITEM #4: INTERVIEW-JOHN LUI, TECHNICAL STAFF MEMBER
Lui discusses how the camera works

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
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For Release

Jim Cast
Headquarters, Washington, DC
(Phone: 202/358-1779)

February 12, 1996

RELEASE: 96-28

INNOVATIVE SPACE CONCEPTS SELECTED FOR NEGOTIATIONS

NASA has selected eight innovative advanced space concepts proposals to begin cooperative agreement negotiations as part of its Advanced Concepts Research Projects (ACRP) Program.

The ACRP was established by NASA as a means of identifying and defining advanced, new concepts and technologies with the potential to effect revolutionary improvements in future U.S. space endeavors. ACRP projects will be led by principal investigators who will be designated as "ACRP Fellows". Each selected proposal will be funded at a maximum total dollar amount of $250,000. It is planned that approximately eight projects will be selected every year and that each ACRP project will be conducted over a 24-month period, resulting in about 16 ongoing projects beginning with the second year of the program. The second in this series of solicitations is planned for the summer of 1996.

While the ACRP Fellows' research will focus on their proposed concepts and technologies, the Fellows also will function as members of a broad, interdisciplinary team. Interactions among Fellows and with NASA researchers will be provided through workshops, periodic meetings and through pioneering infrastructures using the Internet.

Over 100 proposals were submitted as a result of the initial solicitation under the ACRP released in September 1995.

The selected proposals cover a wide range of innovative and potentially significant concepts and space technologies, including: fusion-based space propulsion, optical computing, robotics, interplanetary navigation, materials and structures, ultra-lightweight large aperture optics, and innovative modular spacecraft architectural concepts.

The next step for the eight identified proposers is to negotiate final agreements. That process is expected to be complete within 30-60 days.

-more-

The ACRP Program is sponsored by the Advanced Concepts Office, NASA Headquarters, Office of Space Access and Technology, Washington, DC, 20546. Additional information on ACRP as well as other NASA Advanced Concepts Office activities can be found via the Internet at: http://www.hq.nasa.gov/office/acrp/oac.html

A list of ACRP selectees follows:

* Advanced Inflatable Structures for Aerospace. The principal investigator for this project will be Dr. John A. Main; the lead organization is the University of Maine, Orono.

* Advanced Spacecraft Architectural Concepts. The principal investigator for this project will be Dr. David W. Miller; the lead organization is the Massachusetts Institute of Technology, Cambridge, MA.

* Application of Dynamical Systems Theory to the Design and Development of Spacecraft Trajectories. The principal investigator for this project will be Professor Kathleen C. Howell; the lead organization is Purdue University, West Lafayette, IN.

* Field Reversed Configuration Startup Relevant to Fusion Propulsion. The principal investigator for this project will be Dr. Alan L. Hoffman; the lead organization is the University of Washington, Seattle.

* Fractal-Branching Ultra-Dexterous Robots. The principal investigator for this project will be Dr. Hans Moravec; the lead organization is the Carnegie Mellon University, Pittsburgh, PA.

* High Performance Piezoelectric Thin Films for Shape Control in Large Inflatable Structures. The principal investigator for this project will be Dr. Ratnakar R. Neurgaonkar; the lead organization is the Rockwell International Science Center, Thousand Oaks, CA.

* Mars In-Situ Resource Utilization Research. The principal investigator for this project will be Dr. Robert Zubrin; the lead organization is the Boulder Center for Science and Policy, Boulder, CO.

* Smart Optical Random Access Memory for Fast Information Management and Analysis. The principal investigator for this project will be Dr. Hu-Kuang Liu; the lead organization is the University of South Alabama, Mobile.

-end-

Video Advisory

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For Release

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February 13, 1996

VIDEO ADVISORY: V96-15

AIR TRAFFIC CONTROL TOOL FEATURED ON NTV WEDNESDAY

On Wednesday NASA TV will air footage of the Final Approach Spacing Tool (FAST), computer software designed to help air traffic controllers manage aircraft more efficiently and help avoid air traffic delays. FAST is a joint NASA-FAA project currently being developed at the Dallas-Ft. Worth International Airport, TX. Also on Wednesday NASA TV will replay features of flight tests completed on a concept that would take away pilots' windows and replace them with "synthetic vision." This technology could lead to new designs in building future commercial and military aircraft. Features on a revolutionary infrared camera developed by NASA that may present new possibilities to doctors for detecting tumors, for pilots and environmental scientists monitoring weather patterns and pollution, and enabling military forces to identify various types of rockets by their plumes will be replayed Wednesday.

Video News Files air at noon, 3, 6 and 9 p.m. EST

ITEM #1: FAST
New software helps air traffic controllers route planes more efficiently.

ITEM #2: INTERVIEW -- TOM DAVIS, AEROSPACE ENGINEER
Davis discusses value of FAST software.

ITEM #3: WINDOWLESS COCKPIT
Footage of how this new technology is used.

ITEM #4: INTERVIEW-MICHAEL LEWIS, PROGRAM MANAGER
Lewis discusses the "windowless cockpit."

ITEM #5: INFRARED CAMERA
Footage of the camera.

ITEM #6: INTERVIEW-JOHN LUI, TECHNICAL STAFF MEMBER
Lui discusses how the camera works.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
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For Release

Jim Cast
Headquarters, Washington, DC
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February 13, 1996

Jim Doyle
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RELEASE: 96-29

INFRARED CAMERA HAS VARIETY OF USES

A revolutionary new infrared camera developed by NASA may present new possibilities for doctors, pilots and environmental scientists, as well as enable defense forces to identify various types of rockets by their plumes.

The camera, developed at the Center for Space Microelectronics Technology at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA, in partnership with Amber, a Raytheon company, uses highly sensitive quantum-well infrared photodetectors, or QWIPS.

The camera is the only one of its kind at present, according to the development team leader, Dr. Sarath Gunapala of JPL.

The higher sensitivity of long-wavelength QWIPs could allow doctors to detect tumors using thermographic, or heat analysis, allow pilots to make better landings with improved night vision, and enable environmental scientists to monitor pollution and weather patterns. Other possible uses include law enforcement, search and rescue and industrial process control, Gunapala said.

In order for infrared light detectors to work, they must be very cold. The new camera, which weighs less than 10 pounds, contains a Stirling cooler, a closed-cycle refrigerator about the size of a fist. The small motor cycles cooling gas millions of times and cools the camera from room temperature to very low temperatures, about -343 degrees Fahrenheit (-208 Celsius), in about ten minutes.

The camera can be hooked to batteries to make it more portable, but the current prototype plugs into a 110-volt wall socket for power. It is 4.4 inches wide, 10.3 inches deep and 7.2 inches high and weighs 9.9 pounds.

-more-

This quantum well infrared photodetector technology has been developed over the past half decade under contract to NASA's Office of Space Access and Technology.

-end-

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February 13, 1996

RELEASE: 96-30

PILOTS TEST 'SYNTHETIC VISION' WITH WINDOWLESS LANDINGS

NASA has flight tested a "synthetic vision" concept that promises to help make supersonic flight practical and affordable for the average air traveler close to the turn of the century. The tests – in which pilots conducted windowless landings – were flown on a NASA 737 research aircraft over a three-month period ending in January.

Sensors tested included a digital video camera, three infrared cameras, and two microwave radar systems. The video and infrared images were combined with computer-generated graphics that gave the pilot cues during approaches and landings. One goal of the tests is to identify sensors that will replace or exceed the capabilities of human vision.

The same technology will provide all weather flying capabilities for high speed civil transport and future subsonic transports, allowing pilots to fly and land safely in low visibility conditions. This will increase the number of flights in poor weather, reduce terminal delays and cut costs for the airline industry and passengers.

Researchers are hoping that by enhancing the pilot's vision with high-resolution video displays, aircraft designers of the future can do away with the expensive, mechanically-drooping nose of early supersonic transports. Forward-looking windows would be eliminated, making way for large-format displays filled with high-resolution images and computer graphics.

As envisioned, such an aircraft would carry about 300 passengers at speeds up to Mach 2.4, (about 1,400 mph) over a 5,000 nautical mile range. Travel time across the Pacific Ocean would be cut in half, with only an approximate 20 percent fare increase over current subsonic prices.

-more-

The tests were flown on NASA's Transport Systems Research Vehicle (TSRV), a Boeing 737 equipped with a windowless research cockpit, and a Westinghouse BAC 1-11 avionics test aircraft. About 20 flights took place from NASA's Wallops Flight Facility at Wallops Island, VA, and Langley Air Force Base in Hampton, VA.

The flight tests consisted of two phases. During the sensor data collection phase, the TSRV and BAC 1-11 flew typical approach, cruise and holding patterns and tested the suitability of sensors to detect airborne traffic and ground objects. During the pilot-in-the-loop phase, the TSRV flew approaches and landings from the research cockpit and tested the pilot's ability to easily control and land the aircraft relying only on the sensor and computer-generated images and symbology.

The flight tests are part of the HSR Program's Flight Deck Systems research effort, a part of which aims to develop technologies allowing airframe companies to design, build and certify a cockpit without forward facing windows. Such a cockpit is important to a high-speed civil transport because it would avoid the need to incorporate a Concorde-like drooped nose design, which adds weight and mechanical complexity and increases fuel required for every flight.

The TSRV is a Boeing 737 aircraft that has been modified to incorporate a research flight deck in the passenger section. This research aircraft has been operated by NASA for more than 21 years and has conducted pioneering flight systems and aeronautics research ranging from electronic flight displays to first-of-its-kind satellite navigation and guidance, to proving the viability of airborne wind shear sensors.

The HSR Flight Deck research team includes NASA Langley Research Center, Hampton, VA; NASA Ames Research Center, Mountain View, CA; The Boeing Company, Seattle, WA; McDonnell Douglas Corporation, Long Beach, CA; and Honeywell Incorporated, Phoenix, AZ. Subcontractors supporting the flight tests included Rockwell Collins, Cedar Rapids, IA; FLIR Systems, Portland, OR; and Westinghouse Electric Corporation, MD.

- end -

Video Advisory

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David E. Steitz
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February 14, 1996

VIDEO ADVISORY: V96-16

NEW ABILITY TO PREDICT GEOMAGNETIC STORMS ON NTV

NASA will announce new findings on solar storms Thursday, which will benefit the telecommunications and power industries, among others. The briefing carried live on NASA TV tomorrow at 3 p.m. EST from NASA's Jet Propulsion Laboratory, Pasadena, CA. The findings come from the Japan/U.S. Soft X-Ray Telescope on board the Yohkoh spacecraft. This new ability to predict geomagnetic storms will allow America's power and telecommunications suppliers to monitor the beginnings of storms on the Sun and then prepare transmitters and power grids for the magnetic onslaught before it disrupts the Earth's atmosphere. Supporting animation will be shown during the day's video news file.

Also on Thursday NTV will air features on measuring aircraft pollution in flight, as well as background information of the upcoming Space Shuttle mission. NTV will replay footage of the Final Approach Spacing Tool (FAST), computer software designed to help air traffic controllers manage aircraft more efficiently and help avoid air traffic delays.

Video News Files air at noon, 3, 6 and 9 p.m. EST

ITEM #1: POLLUTION MEASUREMENT
Researchers measure pollution emitted from jet engines.
ITEM #2: INTERVIEW -- LAMONT POOLE, SUBSONIC ASSESSMENT SCIENTIST
Poole discusses the pollution assessment program.
ITEM #3: NEAR EARTH ASTEROID RENDEZVOUS ANIMATION
Animation of the NEAR spacecraft, which is due to launch Friday.
ITEM #4: INTERVIEW -- MARIO ACUNA, NEAR MAGNETOMETER
Science leader discusses NEAR Magnetometer.
ITEM #5: STS-75 PAYLOAD ANIMATION
Animation of upcoming Shuttle mission payload, due to launch Feb. 22.
ITEM #6: STS-75 DYNAMICS ANIMATION
Animation of the Tethered Satellite System dynamics.
ITEM #7: TETHERED SATELLITE SYSTEM
Background on the Tethered Satellite System.
ITEM #8: REPLAY -- FAST
ITEM #9: REPLAY -- INTERVIEW -- TOM DAVIS, AEROSPACE ENGINEER

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News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

February 14, 1996

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Federal Aviation Administration, Washington, DC
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RELEASE: 96-31

NASA/FAA TESTING NEW AIR TRAFFIC MANAGEMENT TOOL

NASA and the Federal Aviation Administration (FAA) are testing a new software tool designed to help air traffic controllers manage aircraft more efficiently and reduce delays by up to 20 percent.

Tests of the Final Approach Spacing Tool (FAST), developed by NASA's Ames Research Center, Mountain View, CA, are being conducted at the Dallas/Fort Worth International Airport's (DFW) Terminal Radar Control Facility. Tests of the first phase began last week and will continue through May.

"We believe that FAST can provide valuable benefits to all airspace users," said Robert M. Valone, Director of FAA's Office of Air Traffic Systems Development. "The tests at DFW will help us prove that."

"The main purpose of these field tests is to validate the new software tools before the FAA displays them nationally," said Tom Davis, an Ames aerospace engineer and FAST project leader. The project goal is to have FAST installed in 5-10 airports by the year 2000.

"If FAST is implemented on a national basis, we should see a significant decrease in delays and an increase in capacity at major airports," Davis said. He said FAST could increase an airport's capacity to handle arriving aircraft by 20 to 30 percent while reducing arrival delay times by 20 percent.

"This system also will assist controllers in making runway assignments which should help decrease arrival delays, particularly during marginal weather conditions," said Earl Wolfe, manager of air traffic control for American Airlines.

-more-

"We're looking forward to cooperating with the FAA and NASA and doing the prototype at DFW," Wolfe said. "We expect that this system will be of great assistance to both controllers and the airline industry in increasing efficiency and capacity of airports throughout the United States in the coming years."

Depending on the size of the aircraft, FAA separation criteria require aircraft to stay three to six miles apart from each other for safety reasons. "Controllers typically will give themselves an extra buffer of approximately half a mile between aircraft in order to guarantee they can meet the spacing requirements," Davis said.

"We can safely reduce that buffer by two-tenths to three-tenths of a mile with this technology," he said. "When you add up how that affects more than one hundred airplanes arriving each hour at a major airport like Dallas Fort Worth, this will substantially increase the airport's arrival capacity," Davis said. "This should result in significant savings to the airlines and hopefully, lower ticket prices for passengers."

The main function of FAST is to provide advisories to help controllers manage arriving aircraft and achieve an accurately spaced flow of traffic on final approach. The field tests will investigate the FAST advisories that recommend which runway to land on and the landing sequence for the aircraft.

"FAST accurately predicts arrival times based on specific knowledge of the type of aircraft, weather conditions and airport landing procedure," Davis said. FAST also advises the air traffic controllers how to accurately meet the schedule and assure the required aircraft separations for safety purposes.

"FAST issues advisories to the air terminal radar controllers recommending which runway to land, aircraft landing sequence, where to turn and where to slow down in order to implement this reorganized plan all the way to the runway," Davis said.

Research and development of the FAST software began at Ames in 1989. In 1991 the FAA began a joint research effort with NASA to take the newest technology available and incorporate it into their facilities and equipment to improve their service to all of the users in the National Airspace System.

-end-

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National Aeronautics and
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For Release

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February 14, 1996

Randall Kremer
National Museum of Natural History
(Phone: 202/786-2950)

RELEASE: 96-32

NASA AWARDS GRANT FOR SMITHSONIAN GLOBAL CHANGE EXHIBIT

NASA's Mission to Planet Earth program has awarded a $500,000 grant to the Smithsonian Institution's National Museum of Natural History to support planning for a new museum exhibition hall titled "Forces of Change."

"Forces of Change" will feature a series of regional case studies demonstrating the ways in which the Earth's environment is changing and how humans affect or are affected by these processes. Initial case studies on the Antarctic polar region, the Hawaiian islands, the Chesapeake Bay estuary and the Great Plains grasslands will offer museum visitors interactive, state-of-the-art displays on how natural forces influence their daily lives.

"NASA is excited to have the opportunity to work with the Museum of Natural History in communicating the results of the most recent studies of the global environment through an inventive forum that blends scientific research and educational outreach," said Dr. Robert Harriss, science division director for Mission to Planet Earth.

Additional programming in the form of books, film and lecture series, CD-ROM packages and classroom materials will be developed in conjunction with each case study. The exhibition will continually challenge visitors to learn more about the world in which they live and to think about their roles in shaping that world, according to Acting Museum Director Donald J. Ortner.

"This generous grant from NASA enables the National Museum of Natural History to advance a ground-breaking exhibition which fully realizes our charter mission to be 'dedicated to understanding the natural world and our place in it,'" Ortner said. "We plan to create an exciting exhibition series to help visitors better understand the interdependencies between humans and the environment."

-more-

The "Forces of Change" project is being developed with extensive consultation among scientists, anthropologists, and educators at the museum. Many other experts from outside the museum, including artists, photographers, environmental engineers and maritime historians, will also be involved in the project to ensure a thorough and balanced discussion of the topic, Ortner said. A date for the anticipated opening of the hall will be announced after the completion of the planning process.

NASA's Mission to Planet Earth is a comprehensive science research enterprise designed to observe the Earth's land, atmosphere, and oceans from a global perspective using satellites, aircraft and ground-based measurements. Such studies will yield improved weather forecasts, better tools for managing agriculture and forests, information for ocean-related industries and coastal planners, and, eventually, an ability to predict how the Earth's climate will change in the future.

-end-

NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. NASA releases also are available via CompuServe using the command GO NASA.

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

February 15, 1996

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Headquarters, Washington, DC
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Catherine E. Watson
Langley Research Center, Hampton, VA
(Phone: 804/864-6122)

RELEASE: 96-33

JET AIRCRAFT: HOW LARGE A SOURCE OF ATMOSPHERIC POLLUTION?

Every day, thousands of jet aircraft fly through the Earth's atmosphere, but scientists are still uncertain how much pollution is produced. To better understand this relatively unknown source of air pollution, researchers at NASA's Langley Research Center, Hampton, VA, are measuring emissions from the engines of two NASA research jets - a Boeing 737 and a Boeing 757.

During a two-week experiment, as part of NASA's Atmospheric Effects of Aviation Project (AEAP), a NASA T-39 jet will fly behind a NASA 737. Instruments aboard the T-39 will measure various chemicals and small pollutant particles (called aerosols) emitted by the 737's engines. The T-39 data also will be used to study how the 737's engine emissions disperse in the atmosphere, and how rapidly. Jet engine emissions can often be seen in the atmosphere in the form of contrails flowing behind the aircraft.

The NASA 737 also will fly over a ground-based laser system at Langley that can measure how many aerosols are emitted from the engines. These aerosol measurements can be used as tracers to study how air flows around the jet, dispersing the emissions into the atmosphere. Jet engine emissions have been shown to affect the concentrations of atmospheric water vapor and aerosols, and they may affect how clouds form and the concentrations of atmospheric ozone. Few actual measurements of their effects have been made, however.

In addition to the ground-based laser system and the T-39, researchers from the University of Missouri-Rolla will measure engine emissions from both the 737 and the 757 in ground tests at Langley. Using a probe mounted near the rear of the engine, the University of Maryland researchers will measure how many aerosols are emitted by each engine and their relative sizes.

The data collected during this experiment will provide AEAP scientists with a unique data set to help them better understand how jet aircraft emissions are affecting our atmosphere and how these emissions are dispersed.

- end -

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

February 21, 1996

VIDEO ADVISORY: V96-20

LAUNCH OF SPACE SHUTTLE COLUMBIA ON NTV THURSDAY

Starting at 10 a.m. EST on Thursday NASA TV will air live launch coverage of the Space Shuttle Columbia from the Kennedy Space Center, FL. Columbia is set for a 3:18 p.m. EST launch Thursday, with a launch window of 2-1/2 hours.

Marking the 75th flight in the history of the Space Shuttle Program, Columbia and crew will carry an Italian tethered satellite into space and conduct microgravity experiments during the 13 day mission.

10 a.m. EST **LAUNCH STATUS BRIEFING FROM KENNEDY SPACE CENTER**

3:18 p.m. EST **LAUNCH OF COLUMBIA**

STS-75 Launch information: Kennedy Space Center, 407/867-2468
During mission information: Johnson Space Center, 713/483-5111

Mission information, including television schedules and sighting opportunities, may be found via the Internet and World Wide Web at the Shuttle homepage URL:

http://shuttle.nasa.gov/

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

February 21, 1996

Don Savage
Headquarters, Washington, DC
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Tammy Jones
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-5566)

Ray Villard
Space Telescope Science Institute, Baltimore, MD
(Phone: 410/338-4514)

RELEASE: 96-34

STUDENTS TO MAKE OBSERVATIONS USING HUBBLE SPACE TELESCOPE

Students in grades K-12, working alongside some of America's foremost astronomers, will have a chance this spring to help do real science observations using NASA's Hubble Space Telescope. The resulting observations will be featured in a live, interactive telecast on NASA TV and public television in March and April.

The observing time was offered for students by astronomers from a lively discussion and debate via the Internet. Students were challenged to go on-line to research and decide which planet in the solar system would be best to study. Neptune and Pluto were selected as targets by students who will be serving as Hubble Space Telescope "Co-Investigators".

Over the next two months, mission planners will transform the students' selection into detailed plans for the observations. Students will be able to follow the progress of their upcoming observations via the Internet. The students then will be featured on "Live from the Hubble Space Telescope: Making Your Observations" airing at 1 p.m. EST, March 14, and on "Live from the Hubble Space Telescope: Announcing Your Results" airing at 1 p.m. EST, April 23.

"Live from the Hubble Space Telescope" is part of the ongoing Passport To Knowledge series. The series provides low- or no-cost access to "real science, real scientists, real locations, real-time" by using integrated multimedia components -- print, on-line and live video.

Passport To Knowledge is supported by NASA, the Space Telescope Science Institute, the National Science Foundation and public television.

-more-

For more information, access the project's home page on the World Wide Web at:

http://quest.arc.nasa.gov/livefrom/hst.html

or send e-mail to:

listmanager@quest.arc.nasa.gov
and in the message body write:
subscribe updates-hst

An information hotline is available on 1-800-626-LIVE (626-5483) or (908)273-4108.

-end-

NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. NASA releases also are available via CompuServe using the command GO NASA.

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

February 22, 1996

Ed Campion
Headquarters, Washington, DC
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Kyle Herring
Johnson Space Center, Houston
(Phone: 713/483-5111)

RELEASE: 96-35

ASTRONAUTS LOW, MEADE LEAVE CORPS

Astronauts G. David Low and Carl J. Meade (Colonel, USAF) will leave NASA in February to pursue other aerospace careers. Low left NASA February 20 and Meade will depart at the end of the month.

Low will join Orbital Sciences Corporation's Launch Systems Group in Dulles, VA. Meade will join Lockheed Skunk Works in Palmdale, CA, next month as the X-33 deputy program manager. The project is an effort between civil aerospace companies and NASA to develop a potential next-generation reusable launch vehicle.

Both Low and Meade flew on three Space Shuttle missions. Low flew on STS-32 in 1990, STS-43 in 1991 and STS-57 in 1993. Meade flew on STS-38 in 1990, STS-50 in 1992 and STS-64 in 1994.

For complete biographical information on Low, Meade and other astronauts, see the NASA Internet astronaut biography home page at address:
http://www.jsc.nasa.gov/Bios/

-end-

News Release

National Aeronautics and
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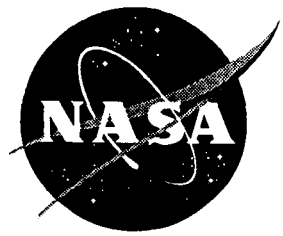

For Release

Dwayne C. Brown
Headquarters, Washington, DC
(Phone: 202/358-1600)

February 23, 1996

NOTE TO EDITORS: N96-11

AEROSPACE SAFETY ADVISORY PANEL TO PRESENT REPORT TO NASA

The Aerospace Safety Advisory Panel (ASAP) will present its annual report to NASA Administrator Daniel S. Goldin at 2:00 p.m. EST on Thursday, Feb. 29, 1996, in the Administrator's Program Review Center (9H40), NASA Headquarters, 300 E Street S.W., Washington, DC.

Each year, the panel reviews and evaluates current and future NASA programs and activities and reports their findings to the NASA Administrator. Priority is given to programs that involve the safety of human flight.

Following the Apollo spacecraft fire on Jan. 27, 1967, Congress enacted legislation to establish the ASAP as a senior advisory committee to NASA.

The ASAP report will be available for media representatives at 1:00 p.m. Thursday in the NASA Headquarters Newsroom (202/358-1600). The report also will be distributed at the meeting.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

February 23, 1996

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Donna Drelick
Goddard Space Flight Center, Greenbelt, MD
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NOTE TO EDITORS: N96-12

UPDATE ON DISCOVERY OF NEW ASTRONOMICAL OBJECT SET FOR FEB. 28

Discovery of a new type of object in the Milky Way galaxy will be the subject of a Space Science Update scheduled for 3 p.m. EST Wednesday, Feb. 28.

The unusual object, never before observed, has produced more than 1,000 powerful hard X-ray bursts and is thought to be a major discovery in X-ray astronomy. The discovery was made by researchers using the Burst and Transient Source Experiment, an instrument aboard NASA's Compton Gamma Ray Observatory spacecraft.

Participants in the panel discussion will include:

Dr. Chryssa Kouveliotou, USRA, Marshall Space Flight Center
Prof. Frederick K. Lamb, University of Illinois
Dr. Stephen P. Maran, Goddard Space Flight Center
Prof. Bruce H. Margon, University of Washington

The briefing will originate from NASA Headquarters Auditorium, 300 E Street, SW, Washington, DC, and will be broadcast live on NASA TV with two-way question and answer capability from participating NASA locations. Audio of the broadcast will be available on voice circuit at the Kennedy Space Center on 407/867-1260.

-end-

Video Advisory

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

For Release

February 27, 1996

VIDEO ADVISORY: V96-21

SPACE SCIENCE UPDATE BRIEFING ON NTV WEDNESDAY

On Wednesday at 3 p.m. EST NASA Television will air a live Space Science Update program that will discuss the discovery of a new type of celestial object that was recently found by the Burst and Transient Source Experiment (BATSE), an instrument aboard the Compton Gamma Ray Observatory. Animation and interviews will be aired at noon and at the start of the briefing at 3 p.m. EST to support illustration of the discovery.

NOON, 3 P.M.: VIDEO NEWS FILE (TRT 4:00):

ITEM #1: NEUTRON STAR ANIMATION
Animation of neutron star.
ITEM #2: X-RAY ANIMATION
Animation of the new X-ray pulsar burst discovered by BATSE.
ITEM #3: X-RAY DISCOVERY
A new type of X-ray object has been discovered. The object emits powerful and frequent bursts of X-ray energy.
ITEM #4: INTERVIEW - DR. GERALD FISHMAN
Fishman discusses the BATSE discovery.
ITEM #5: INTERVIEW - DR. CHRYSSA KOUVELIOTOU, ASTROPHYSICIST
NASA astrophysicist discusses BATSE discovery.

NASA TV also will continue to provide live coverage of the Space Shuttle Columbia mission on Wednesday.

STS-75 landing information:	Kennedy Space Center, 407/867-2468
During mission information:	Johnson Space Center, 713/483-5111

Mission information, including television schedules and sighting opportunities, may be found via the Internet and World Wide Web at the Shuttle home page URL:

http://shuttle.nasa.gov/

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

February 28, 1996

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RELEASE: 96-37

NEW TYPE OF ASTRONOMICAL OBJECT DISCOVERED IN OUR GALAXY

NASA astronomers have discovered a new type of object towards the center of our Milky Way galaxy exhibiting a combination of behaviors never before seen in the 35-year history of gamma-ray astronomy.

During the first day it was observed, the source produced over 140 powerful bursts of gamma-rays; since then, it has settled down to a daily rate of about twenty bursts, and it is currently the brightest source of hard X-ray/gamma-rays in the sky.

The discovery will be announced tomorrow in a paper published in the scientific journal "Nature" by scientists from NASA's Marshall Space Flight Center, Huntsville, AL; the University of Alabama in Huntsville; the Massachusetts Institute of Technology in Cambridge, MA; and the University of Amsterdam in the Netherlands.

The unusual object in the southern sky was discovered in early December 1995 by researchers using an instrument known as the Burst and Transient Source Experiment, aboard NASA's Compton Gamma Ray Observatory spacecraft. Since December 2, the new burster has produced more than 1,000 hard X-ray bursts.

"We're particularly excited about the discovery of a new X-ray source," said NASA Marshall astrophysicist Dr. Gerald Fishman. "The object's strange behavior is one of the major discoveries in X-ray astronomy in the past decade."

-more-

Apparently the sky had more surprises in store for the observers. In mid-December, the NASA scientists discovered an additional source of steady radiation that seemed to reside at the same position in the sky with the burster. This new object further surprised scientists when it was observed to continuously emit pulses at a rate of about twice per second. It was now classified as a pulsar, and the question that the observers faced was "what was the relation, if any, between the two objects?" said Dr. Chryssa Kouveliotou of the Universities Space Research Association at the Marshall Center.

The answer soon came back: the burster and the pulsar were one and the same source.

"The properties of this X-ray source are unlike those of any we know," explained Dr. Kouveliotou. "The burst repetition rate makes this phenomenon very different from gamma ray bursts that we have observed several thousand times from throughout the universe. Also, the longer duration and persistent bursting makes the object very different from so-called Soft Gamma Ray Repeaters, which have been observed to burst in short, isolated episodes separated by several years."

"What's unique about this object is that it does so many different things all at once," said Fred Lamb, an astrophysicist at the University of Illinois at Urbana-Champaign. "We've seen some sources that play the drums, some that crash cymbals, and a few that play the trumpet, but this source is a one-man band."

This bursting pulsar was later found by Dr. Mark Finger of the Universities Space Research Association at NASA Marshall to be a member of a binary system, performing one full revolution around its low-mass companion every 12 days. "The most likely explanation at this time is that the bursts of X-ray energy may result when the lighter of the pair of stars loses its material by gravitational or magnetic forces to the neutron star," said Kouveliotou.

A neutron star is an exotic star with a mass greater than the Sun and a diameter of only about 10 miles. "The discovery of the new X-ray source may lead to a better understanding of how neutron stars form and evolve," Kouveliotou said.

The source was discovered shortly before the recent launch of NASA's Rossi X-ray Timing Explorer (RXTE) spacecraft, which carries the largest collecting area of X-ray detectors ever flown in space. "Our highest scientific priority, after evaluating the operation of the satellite and X-ray instruments, was observing this transient source" said Frank Marshall, Director of RXTE's Science Operations Center.

"With better measurements, we should be able to pin downthe theoretical model," says Jean Swank, RXTE Project Scientist. As soon as RXTE could observe the source, its detectors were pointed to obtain detailed information about the X-ray spectrum and its variations.

The two large instruments on the spacecraft, provided by teams led by Swank of NASA's Goddard Space Flight Center, Greenbelt, MD, and Richard Rothschild of the University of California at San Diego, quickly found the source to be very bright across the X-ray band from 2 to 60 keV, with strong persistent emission as well as numerous bursts.

"First, matter is accelerated to half the speed of light because of the neutron star's enormous gravitational force. Then, it crashes into the surface of the neutron star and is heated to nearly one billion degrees," Lamb explained. "Because it is so hot, it radiates almost entirely in X-rays rather than visible light, in this case with a power comparable to 1 million times the power of the Sun originating from an area about the size of the National Mall in Washington, DC."

RXTE made repeated scans across the source to determine the position of the source accurately enough to allow astronomers to search for radio or visible light from it. Within the past ten days, a radio source and a very faint visible star have been identified in the direction of the X-ray source. Scientists are working furiously to see if the radio and visible light are coming from this object.

The bursting pulsar is a transient X-ray star that is expected to die out fairly soon, within a few weeks to, at most, a few months. Therefore, scientists are working feverishly to try to unravel its mysteries while it still shines.

The Compton Gamma Ray Observatory, which was launched in 1991, is managed by NASA's Goddard Space Flight Center, Greenbelt, MD, and the Burst and Transient Source Experiment is managed by NASA Marshall. The Rossi X-Ray Timing Explorer, launched on December 30, 1995, is managed by NASA Goddard.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

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Headquarters, Washington, DC
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February 28, 1996

Jim Sahli
Goddard Space Flight Center, Greenbelt, MD
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RELEASE: 96-38

NASA RENAMES X-RAY TIMING EXPLORER IN HONOR OF BRUNO B. ROSSI

NASA will name the X-ray Timing Explorer, placed into orbit in December 1995, in honor of a pioneer in the field of X-ray astronomy, Bruno B. Rossi. The new official title of the 6,700-pound observatory is the Bruno B. Rossi X-ray Timing Explorer (RXTE).

The RXTE is currently in a circular 360-statute-mile (580-kilometer) orbit with an inclination of 23 degrees. Among the objects to be studied by RXTE are stellar black holes, neutron stars and quasars.

Professor Rossi and his colleagues discovered the first non-solar source of X-rays in a dramatic rocket flight in 1962. This source, Scorpius X-1, was the first of many collapsed stars that also are a key topic of study for the RXTE.

Rossi, who died in 1993 after a long and distinguished career, served as professor of Physics and Professor Emeritus at the Massachusetts Institute of Technology. He can be described as a pioneer in two separate fields of observational space astrophysics: X-ray astronomy and space plasma physics. He was the co-recipient of the prestigious Wolf Prize in Physics in 1987. The Bruno Rossi Prize, awarded annually by the American Astronomical Society to a top astrophysicist for achievements in the field, is named in his honor.

The spacecraft, which is about the size of a telephone booth, is carrying three science instruments which work together to increase scientific understanding of cosmic X-rays sources.

Two of these instruments -- the Proportional Counter Array (PCA) and the High-Energy X-ray Timing Experiment (HEXTE) -- work in concert as the largest X-ray telescope yet flown, sensitive to X-rays from 2 to 200 keV.

- more -

The third instrument, the All Sky Monitor (ASM), observes the long-term behavior of X-ray sources. The ASM also serves as a sentinel which monitors the sky and enables the spacecraft to swing rapidly to targets of opportunity for the PCA and the HEXTE.

RXTE is the first mission for which 100 percent of the observing time will be available to the broad scientific community. Specific observations will be proposed by scientists from the United States and abroad. Observations are planned by scientists at the XTE Science Operations Center at NASA's Goddard Space Flight Center, Greenbelt, MD.

The RXTE was developed by and is managed and operated by Goddard for NASA's Office of Space Science, Washington, DC.

- end -

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News Release

National Aeronautics and
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Washington, DC 20546
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For Release

February 26, 1996

Ray Castillo
Headquarters, Washington, DC
(Phone: 202/358-4555)

Jeff Carr
Johnson Space Center, Houston, TX
(Phone: 713/483-2680)

RELEASE: 96-39

NASA TO FORM INDEPENDENT REVIEW PANEL

NASA is forming an independent panel to review the loss of the Tethered Satellite, Wil Trafton, Acting Associate Administrator for the Office of Space Flight, announced today. The team will be chaired by Kenneth Szalai, Director of the Dryden Flight Research Center, Edwards, CA. A preliminary report with recommendations is due to Trafton within 75 days.

"Given the public investment in the tethered satellite, it is important that we find out what went wrong," said Trafton. "To do any less would be a disservice to the American and Italian people."

The independent review team will be chartered under NASA's Space Flight Operations Contingency Plan. This is standard practice with in-flight anomalies of this magnitude.

- end -

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

February 27, 1996

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Headquarters, Washington, DC
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Ernie J. Shannon
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-6256)

RELEASE: 96-40

MCDONNELL DOUGLAS AEROSPACE AWARDED CONTRACT TO PROVIDE MED-LITE ELV SERVICES

NASA has awarded McDonnell Douglas Aerospace, Huntington Beach, CA, a contract to provide fixed-price medium-light (Med-Lite) class expendable launch vehicle services. The Orbital Sciences Corp., Dulles, VA, is a major subcontractor.

The contract has the potential value of approximately $500 million depending on the number of options exercised, vehicle configurations, and mission-unique requirements.

The program, which will be managed by the Goddard Space Flight Center, Greenbelt, MD, is scoped to provide launch capability in the range of 4,400 pounds (1,995 kg) to low Earth orbit. At the time of contract award, three missions have been named as Med-Lite payloads: the Far Ultraviolet Spectroscopy Explorer (FUSE); 1998 Mars Surveyor Orbiter-2; and 1998 Mars Surveyor Lander-1. The Orbiter is scheduled for launch in December 1998, the Lander is scheduled for launch in January 1999. FUSE is scheduled for launch in 1998. In addition to the three named missions, two firm unnamed missions are scheduled for flight under the new contract as well as nine optional missions for a total of 14 launch services.

The contract includes an eight-year ordering period for the optional missions beginning at the time of the signing. McDonnell Douglas proposed a nominal 30-month call-up for each launch service. Launches are planned from both the East and West Coast to support Discovery, Explorer and Mission to Planet Earth requirements.

McDonnell Douglas is the prime contractor and will provide launch services under the contract with Delta II 7300, Delta-Lite and Taurus vehicles. The Delta-Lite will be available under this contract, when developed by McDonnell Douglas.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

February 29, 1996

Don Nolan-Proxmire
Headquarters, Washington, DC
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Lori Rachul
Lewis Research Center, Cleveland, OH
(Phone: 216/433-8806)

RELEASE: C96-b

NASA SELECTS GE AIRCRAFT ENGINES FOR TECHNOLOGY DEVELOPMENT

NASA's Lewis Research Center, Cleveland, OH, has awarded a $61.8 million five-year contract to General Electric Aircraft Engines, Cincinnati, OH, to develop critical technologies for the next generation of U.S. subsonic commercial engines.

Under the cost-reimbursement-without-fee contract, critical advancements will be pursued to reduce nitrogen oxide emissions by 70 percent and expected future engine noise levels. Research also will be conducted on engine technologies that will improve fuel efficiency by eight percent and direct operating costs by three percent.

Work to be performed under the propulsion category includes low emission combustor development; validated aerodynamic and aeroelastic codes for turbomachinery; lightweight affordable engine structures; and lubrication systems for geared engines.

Areas of development for engine noise reduction technology include aerodynamic and aeroacoustic prediction code development; fan/nacelle noise reduction concept design and testing; and active noise reduction concept development and demonstrations.

Contract results are expected to provide the technical data to address pending emission and noise regulations that will impact the large engines (20,000 to 100,000 lb. thrust) that will enter commercial service in the year 2000 to 2005.

The company will develop and demonstrate these technologies at their facilities in Cincinnati, as well as at Lewis.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

Ed Campion
Headquarters, Washington, DC
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February 29, 1996

Steve Nesbitt
Johnson Space Center, Houston, TX
(Phone: 713/483-5111)

RELEASE: 96-41

NASA ASSIGNS HAWLEY TO SECOND HUBBLE SERVICING MISSION

Dr. Steven A. Hawley, a veteran of three Space Shuttle missions before moving into management positions within NASA, has been returned to astronaut flight status and named to the crew of the second Hubble Space Telescope servicing mission.

The mission, designated STS-82, is scheduled for February 1997 on Space Shuttle Discovery. Hawley's primary duty will be to operate the shuttle's 50-foot robot arm. He was a member of the crew of STS-31 which first deployed Hubble in April 1990.

Hawley, 44, will join astronauts Mark C. Lee, Gregory J. Harbaugh, Steven L. Smith and Joseph R. Tanner, all previously named as mission specialists on the flight. A mission commander and pilot will be named later.

In June 1990, Hawley left the astronaut corps to become Associate Director of Ames Research Center, Mountain View, CA. He returned to the Johnson Space Center in August 1992 as Deputy Director of Flight Crew Operations.

Hawley is a native of Ottawa, KS, but considers Salina, KS, his hometown. He earned a doctorate in astronomy and astrophysics from the University of California in 1977. He joined the astronaut corps in January 1978 in the first group of astronauts selected specifically for the Space Shuttle Program. Hawley flew on Shuttle missions 41-D in 1984, 61-C in 1986, and STS-31 in 1990. He has logged over 412 hours in space.

-end-

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News Release

National Aeronautics and
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Washington, DC 20546
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For Release

Edward Campion
Headquarters, Washington, DC
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Rob Navias
Johnson Space Center, Houston, TX
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March 1, 1996

RELEASE: N96-13

BRIEFINGS SET FOR THIRD SHUTTLE-MIR DOCKING MISSION

The objectives of the third Shuttle-Mir docking mission will be discussed in a series of briefings scheduled for Tuesday, March 12 from the Johnson Space Center (JSC), Houston, TX, and the Jet Propulsion Laboratory (JPL), Pasadena, CA.

Six astronauts, including veteran astronaut Shannon Lucid, will link up to the Russian Mir space station around 43 hours after launch to begin five days of joint science operations and hardware and logistics transfers between the two spacecraft. Lucid will remain on Mir for approximately 142 days, joining Mir 21 cosmonauts Yuri Onufrienko and Yuri Usachev, who were launched to Mir on Feb. 21 aboard a Soyuz rocket.

Lucid will initiate a permanent U.S. presence aboard the Russian outpost for more than two years. She will be followed on the Mir by at least four other astronauts on a rotating basis through the spring of 1998.

The Spacehab module will be featured on the flight of Atlantis, in which a number of experiments will be housed, including the European Biorack experiment. In addition, two of Atlantis' crewmembers, Linda Godwin and Rich Clifford, will conduct a six-hour spacewalk while the Shuttle is docked to Mir to attach a group of experiments to the Mir's Docking Module.

The briefings will begin at 9 a.m. EST at Johnson with a briefing on the Phase One program, which oversees the joint Shuttle-Mir missions. At 10 a.m. EST, the Mission Overview briefing will be conducted by Lead Flight Director Phil Engelauf. A briefing on Spacehab's role in the mission will be conducted at 11 a.m. EST.

-more-

Briefings will resume at 12:30 p.m. EST with the briefing on the spacewalk to be conducted while Atlantis and Mir are docked. At 1:30 p.m. EST, the briefing on the KidSat payload will be held at JPL. The day's briefings will conclude at 2 p.m. EST with the crew news conference. The crew will be available for one-on-one, round-robin interviews after the news conference for reporters attending the briefings at Johnson. Reporters should contact Kyle Herring or Eileen Hawley at 713/483-5111 no later than March 8 if they are interested in participating in the local-only interviews.

All briefings will be carried live on NASA Television with two-way question and answer capability from participating NASA locations.

Following is the briefing schedule (all times are EST):

March 12, 1996

9 a.m. Phase One Overview (originating from JSC)
Frank Culbertson, Acting Director, Phase One Program
Valery Ryumin, Phase One Director, RSC Energia
Dr. John Uri, Mir 21 Mission Scientist

10 a.m. STS-76 Mission Overview (originating from JSC)
Phil Engelauf, Lead Flight Director

11 a.m. Spacehab Overview (originating from JSC)

Noon NASA-TV Video File

12:30 p.m. EVA Briefing (originating from JSC)

1:30 p.m. KidSat Briefing (originating from JPL)

2 p.m. Crew News Conference (originating from JSC)
Kevin Chilton, Commander
Rick Searfoss, Pilot
Ron Sega, Payload Commander
Rich Clifford, Mission Specialist 2
Linda Godwin, Mission Specialist 3
Shannon Lucid, Mission Specialist 4

NASA Television is located on Spacenet 2, Transponder 5, Channel 9 at 69 degrees West longitude. The transponder frequency is 3880 Mhz and the audio subcarrier is 6.8 Mhz. Polarization is horizontal.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

Don Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

March 1, 1996

NOTE TO EDITORS: N96-14

NASA SCIENCE INSTITUTES PLAN RELEASED

NASA has released its NASA Science Institutes Plan report, following a six-month period of study by the NASA Science Institutes Team and modifications based on public comments.

The NASA Science Institutes concept began May 19, 1995, when NASA Administrator Daniel S. Goldin released results of an internal review conducted by the Agency's "Zero Base Review" (ZBR) Team. The ZBR science recommendations included a proposal that science "institutes" be formed at many of NASA's Centers, with goals to strengthen the quality of NASA science, to bind NASA scientists more effectively to the external community and to increase the effectiveness of the links between the external community and NASA's immense engineering and technical resources.

The report is available to media representatives by calling the NASA Headquarters Newsroom at 202/358-1600. The general public may obtain a copy by calling 202/358-2877. In addition to the report, a question and answer fact sheet, a Benchmarks Report, and a NASA Science Institutes Report Forward are available. These documents are available on the internet via anonymous file transfer at:

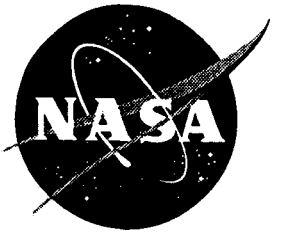
ftp.hq.nasa.gov in the directory pub/oss/inst/, or on the World Wide Web at http://www.hq.nasa.gov.office.oss

- end -

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600



For Release

Don Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

March 1, 1996

NOTE TO EDITORS: N96-14a

NASA SCIENCE INSTITUTES PLAN INTERNET ADDRESS CORRECTION

The Internet address for NASA's Science Institutes Plan in NOTE TO EDITORS N96-14 is incorrect. The correct URL is:

http://galaxy.hq.nasa.gov/Institutes/instplan.html

- end -

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

March 4, 1996

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Headquarters, Washington, DC
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Tammy Jones
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-5566)

Ray Villard
Space Telescope Science Institute, Baltimore, MD
(Phone: 410/338-4514)

NOTE TO EDITORS: N96-15

NEW IMAGES OF PLUTO TO BE PRESENTED AT NEXT SPACE SCIENCE UPDATE

Never-before-seen features on the planet Pluto are visible in images to be released at a Space Science Update scheduled for 2 p.m. EST Thursday, March 7, in the NASA Headquarters auditorium, 300 E Street S.W., Washington, DC.

These images, showing almost a dozen distinctive features, or provinces, on the surface of the solar system's farthest known planet, were sent back by the European Space Agency's Faint Object Camera aboard NASA's Hubble Space Telescope.

Panelists discussing the images will be Dr. Marc W. Buie, Lowell Observatory, Flagstaff, AZ; Dr. S. Alan Stern, Southwest Research Institute, Boulder, CO; Dr. Anne L. Kinney, Space Telescope Science Institute, Baltimore, MD; Dr. Bruce Margon, University of Washington, Seattle, WA; and panel moderator Dr. Steve Maran, Goddard Space Flight Center, Greenbelt, MD.

The Update will be broadcast live on NASA Television, with two-way question-and-answer capability for reporters covering the event from participating NASA Centers. NASA Television is carried on Spacenet-2, transponder 5, channel 9, at 69 degrees West longitude, frequency 3880.0 MHz, audio 6.8 Megahertz.

- end -

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Ed Campion
Headquarters, Washington, DC
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Rob Navias
Johnson Space Center, Houston, TX
(Phone: 713/483-5111)

For Release
March 6, 1996

NOTE TO EDITORS: N96-16

REVISIONS MADE TO TIMES FOR THE STS-76 BRIEFINGS

Due to an extension of the STS-75 Space Shuttle mission, the training schedule for the STS-76 astronauts has been changed, resulting in several revisions to the preflight briefing schedule for the STS-76 mission on March 12. All briefings will originate from the Johnson Space Center (JSC), Houston, TX, with the exception of the KidSat briefing, which will originate from the Jet Propulsion Laboratory (JPL), Pasadena, CA, and the Get Away Special briefings, which will originate from the Goddard Space Flight Center, Greenbelt, MD.

Following is the new briefing schedule (all times are EST):

March 12:

8:30 a.m.	Phase One Overview
9:30 a.m.	STS-76 Mission Overview
10:30 a.m.	STS-76 Crew News Conference
Noon	NASA TV Video News File
1:30 p.m.	EVA Briefing
2:30 p.m.	Spacehab Briefing
3 p.m.	KidSat Briefing (originating from JPL)
3:30 p.m.	Get Away Special Briefings (originating from GSFC)

-more-

The STS-76 astronauts will be available for local-only round-robin interviews after the crew news conference for reporters attending the briefings at JSC. Reporters should contact Kyle Herring or Eileen Hawley at 713/483-5111 no later than March 8 if they are interested in participating in the one-on-one interviews at JSC.

All briefings will be carried live on NASA Television with two-way question and answer capability from participating NASA locations.

NASA Television is located at Spacenet 2, Transponder 5, Channel 9 at 69 degrees West longitude. The transponder frequency is 3880 Mhz and the audio subscarier is 6.8 Mhz. Polarization is horizontal.

-end-

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

March 6, 1996

VIDEO ADVISORY: V96-22

NEW IMAGES OF PLUTO ON NTV THURSDAY

New images of Pluto from the Hubble Space Telescope will air on NASA Television during a live Space Science Update from NASA Headquarters, Washington, DC, at 2 p.m. EST March 7. The images reveal almost a dozen distinctive features, or provinces, on the surface of the solar system's farthest known planet.

NASA TV will air a special Video News File featuring animation and interviews at 1:50 p.m. EST in support of the 2 p.m. Space Science Update.

NASA TV also will continue to provide live coverage of the Space Shuttle Columbia's mission on Thursday. Columbia is set to land at the Kennedy Space Center, FL, on Friday morning, weather permitting.

STS-75 landing information:	Kennedy Space Center, 407/867-2468
During mission information:	Johnson Space Center, 713/483-5111

Mission information, including television schedules and sighting opportunities, may be found via the Internet and World Wide Web at the Shuttle home page URL:

http://shuttle.nasa.gov/

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

March 7, 1996

Dwayne Brown
Headquarters, Washington, DC
(Phone: 202/358-1600)

Jim Doyle
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

RELEASE: 96-42

AUTOMATED GROUND TERMINAL TO REDUCE SATELLITE TRACKING COSTS

A new fully automated, miniaturized antenna station built from off-the-shelf electronic components will significantly reduce the cost of tracking NASA's low-Earth-orbit satellites.

The station, called a Low Earth Orbit (LEO) Terminal, was built at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA, and tested to track and command NASA's Cosmic Background Explorer (COBE) satellite without operator intervention.

"Analysis of the terminal logs and spacecraft telemetry indicated that the terminal worked flawlessly during the demonstration," said Dr. Nasser Golshan, task manager of the development effort.

Development of the terminal was carried out in two phases by a small team of engineers at JPL and SeaSpace Inc., a satellite ground terminal manufacturer in San Diego, CA. In the first phase, JPL upgraded a commercially available weather satellite-tracking terminal and developed a receive-only terminal to gather telemetry from NASA satellites.

That first phase was completed in 1994 with successful demonstrations tracking NASA's Solar Anomalous and Magnetospheric Particle Explorer and the Extreme UltraViolet Explorer. In the second phase, command uplink capabilities were added and showed that the terminal's operation could be completely automated using COBE.

The terminal antenna is enclosed in a fiberglass dome called a radome. The radome protects the microwave electronics and the tracking mechanism from the elements. A four-foot high cabinet houses the station electronics. For testing purposes, the terminal is located on the roof of an eight-story building at JPL.

-more-

Electronics include the telemetry receiver, a command exciter, the antenna controller and a computer workstation. When transmitting, the terminal uses a 200-watt solid-state transmitter power amplifier.

The computer workstation allows for automated, unattended operations of the terminal including automated scheduling, calculation of orbital trajectories, control of the antenna positioner for spacecraft tracking, automated uplink and telemetry operations, communication interfaces for remote command operations, as well as processing and distribution of spacecraft engineering and science data to the mission operations and science users of the data.

Commercial off-the-shelf software has been used extensively to reduce cost and increase reliability. Costs of the equipment and software are between $600,000 and $800,000 depending on the options.

The terminal can receive telemetry at rates up to 1.2 million bits per second. Uplink commands can be sent at up to 2,000 bits per second. Those rates and the operating frequency can be modified with replacement equipment.

Equipped with a 10-foot (3-meter) antenna dish, the terminal is capable of providing telemetry and command support to up to 55 percent of NASA's current and planned LEO missions. A 16-foot (5-meter) dish could extend coverage to 70 percent of the missions.

"This successful demonstration sets a benchmark for low-cost support of Earth-orbiting missions," said Dr. Chad Edwards, manager of the Deep Space Network Technology Program at JPL. "It also shows NASA can work closely with industry to take the best available commercial capabilities and quickly adapt them to meet the needs of NASA science missions."

The concept for this project was conceived and sponsored by NASA's Office of Space Communications, Washington, DC.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Don Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

March 7, 1996
EMBARGOED UNTIL: 2:00 P.M. (EST)

Tammy Jones
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-5566)

Ray Villard
Space Telescope Science Institute, Baltimore, MD
(Phone: 410/338-4514)

RELEASE: 96-43

HUBBLE REVEALS SURFACE OF PLUTO FOR FIRST TIME

For the first time since Pluto's discovery 66 years ago, astronomers have at last directly seen details on the surface of the solar system's farthest known planet from pictures sent back by the European Space Agency's Faint Object Camera aboard NASA's Hubble Space Telescope.

Hubble's snapshots of nearly the entire surface of Pluto, taken as the planet rotated through a 6.4-day period, show that Pluto is a complex object, with more large-scale contrast than any planet, except Earth.

The images also reveal almost a dozen distinctive albedo features, or provinces, none of which have ever been seen before. They include a "ragged" northern polar cap bisected by a dark strip, a bright spot seen rotating with the planet, a cluster of dark spots, and a bright linear marking that is intriguing the scientific team analyzing the images. The images confirm the presence of icy-bright polar cap features, which had been inferred from indirect evidence for surface markings in the 1980s.

This historic new look at Pluto helps pave the way for a proposed Pluto flyby mission early in the next century. Pluto is the only solar system planet not yet visited by a spacecraft.

"Hubble is providing the first, tantalizing glimpse of what Pluto will be like when we get there," said Dr. Alan Stern of Southwest Research Institute's Boulder, CO, research office. Stern led the team who used Hubble to

- more -

obtain the most detailed view yet of Pluto. The Pluto imaging team also includes Dr. Marc Buie of Lowell Observatory, Flagstaff, AZ, and Dr. Laurence Trafton of the University of Texas, Austin. This team of planetary scientists used the Faint Object Camera aboard the Hubble to obtain over a dozen high-quality visible and ultraviolet images of Pluto in mid-1994. These images have now been carefully reduced and analyzed.

"These results and the maps we constructed from them are much better than I ever hoped for," said Buie. "It's fantastic. Hubble has brought Pluto from a fuzzy, distant dot of light, to a world which we can begin to map, and watch for surface changes. Hubble's view of the tiny, distant Pluto is reminiscent of looking at Mars through a small telescope," said Stern.

Some of the sharp variations across Pluto's surface detected in the Hubble images may potentially be caused by such topographic features as basins, and fresh impact craters (as found on Earth's Moon). However, most of the surface features unveiled by Hubble are likely produced by the complex distribution of frosts that migrate across Pluto's surface with its orbital and seasonal cycles. Pluto is so far from the Sun that even nitrogen, carbon monoxide, and methane gases partially freeze onto its surface during the long period (about 100 years) when it is farthest from the Sun.

The Hubble images reveal much more surface variety on Pluto than on other icy objects in the outer solar system, including Pluto's often-cited twin, Neptune's large moon Triton. According to Trafton, "The HST images are confirming Pluto's individuality. It isn't a twin of Triton after all."

During the short, warm season around Pluto's closest approach to the Sun, these ices sublimate (go directly back to a gas), thickening Pluto's atmosphere. "The light areas are as bright as fresh Colorado snow, and the darker areas are more reminiscent of the brightness of a dirty snow," said Stern. The darkest regions likely result from hydrocarbon "residues" from the effects of ultraviolet sunlight and cosmic rays on Pluto's complex chemical melange of surface ices.

Pluto is two-thirds the size of Earth's Moon, and 1,200 times farther away. Pluto's apparent size in the sky is so small (0.1 arcseconds, which equals 1/36,000th of a degree), that 18,000 Plutos would need to be lined up to match the diameter of the full Moon. This puts Pluto's surface below the resolution limit of the largest ground-based telescopes; as a result it has been impossible to directly see any significant detail on Pluto before these Hubble observations.

Viewing such a remote and small body has been so difficult that Pluto's moon Charon wasn't detected until 1978, despite the fact that Pluto itself was discovered by Clyde Tombaugh in 1930.

Shortly after its launch in 1990, the Hubble Space Telescope first peered at Pluto and clearly distinguished the planet and its satellite (which is only 1/3000-th of a degree away) as two separate objects. However, a detailed look at Pluto's surface had to wait until Hubble's optics were improved during the 1993 servicing mission.

The Advanced Camera, planned to be installed on Hubble in 1999, will yield slightly better images of Pluto. This will be the best view of the distant planet until space probes eventually make the long trek across the solar system.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc., for NASA, under contract with the Goddard Space Flight Center, Greenbelt, MD. The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency.

- end -

EDITOR'S NOTE: Images to illustrate this release are available for news media representatives by calling the Headquarters Broadcast and Imaging Branch on 202/358-1900. Photo numbers are:

B&W 96-H-105
B&W 96-H-106

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

March 8, 1996

Ray Castillo
Headquarters, Washington, DC
(Phone: 202/358-4555)

June Malone
Marshall Space Flight Center, Huntsville, AL
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RELEASE: C96-c

NASA RESTRUCTURES/EXTENDS USBI CONTRACT FOR SOLID ROCKET BOOSTER ELEMENTS

NASA's Marshall Space Flight Center, Huntsville, AL, has reached an agreement to restructure and extend its contract with USBI Co. to assemble and refurbish the Solid Rocket Boosters for the Space Shuttle through September 1999.

The value of this 45-month contract restructure and extension is approximately $500 million, and will support a Space Shuttle flight rate of seven flights per year.

"This agreement puts us in the position to continue to safely and successfully assemble, fly, and refurbish the Solid Rocket Boosters for Space Shuttle flights while simultaneously meeting our commitments in this era of declining budgets," said John Chapman, Solid Rocket Booster deputy project manager. "We look forward to continued success with the Solid Rocket Boosters and our work with USBI."

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

March 11, 1996

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Headquarters, Washington, DC
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Bruce Buckingham
Kennedy Space Center, FL
(Phone: 407/867-2468)

NOTE TO EDITORS: N96-18

MANAGERS TARGET MARCH 21 AS LAUNCH DATE FOR NEXT SHUTTLE MISSION

Following a flight readiness review today, Space Shuttle managers are continuing to plan on March 21 as the launch date for Space Shuttle Atlantis on Mission STS-76. The STS-76 mission is the third in a series of missions between America's Space Shuttle and the Russia's space station Mir.

During the meeting, solid rocket motor managers discussed further their findings into the anomaly seen in o-rings of the nozzle to case joint for the boosters used in the STS-75 launch. An additional review is planned for Friday, March 15, 1996.

"We take flight issues like this very seriously and as is always the case, this problem is being aggressively investigated by both the Shuttle and safety communities" said George Abbey, Director, Johnson Space Center, who chaired the review meeting. "The teams working this issue have examined many areas including the way the boosters are processed, the thermal constraints on the system, possible failure scenarios and performance data from previous flights."

The March 21 launch of Atlantis is planned for 3:35 a.m. EST from Kennedy Space Center's (KSC) Launch Complex 39-B. The available launch period, or "window," to launch Atlantis is approximately seven to ten minutes each day.

The STS-76 mission is scheduled to last approximately nine days. Docking with Mir will occur on flight day three. An on-time launch and nominal mission duration would have Atlantis and crew returning to Earth on March 30 with a landing at KSC's Shuttle Landing Facility at approximately 8:04 a.m. EST.

The STS-76 mission will be the 16th mission for Atlantis and the 76th for the Space Shuttle system.

- end -

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

March 11, 1996

VIDEO ADVISORY: V96-23

STS-76 PREFLIGHT BRIEFINGS ON NASA TV TUESDAY

On Tuesday NASA Television will air mission briefings for the upcoming STS-76 Space Shuttle mission, set for launch later this month. STS-76, Space Shuttle Atlantis, will fly the third Shuttle-Mir docking mission, during which American astronaut Shannon Lucid will join the Mir station crew for approximately four months as part of continuing international space cooperation between the the United States and Russia. The Shuttle-Mir missions also are training exercises in preparation for the building of the International Space Station.

At noon NASA TV will air a video news file showing an unpiloted, remotely controlled aircraft called Pathfinder, that uses the Sun's energy to fly to stratospheric altitudes. Pathfinder achieved a milestone flight demonstration on September 11, 1995 that may lead to better understanding of the upper atmosphere and the effect of greenhouse gasses on Earth's environment. Pathfinder Monday received an aviation award for reaching a record breaking altitude of 50,500 feet.

(All times EST)

8:30 a.m. **Phase One Overview**

9:30 a.m. **STS-76 Mission Overview**

10:30 a.m. **STS-76 Crew News Conference**

Noon **Video News File**

1:30 p.m. **EVA Briefing**

2:30 p.m. **Spacehab Briefing**

3 p.m. **KidSat Briefing (from Jet Propulsion Laboratory)**

3:30 p.m. **Get Away Special Briefings (from Goddard Space Flight Center)**

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

March 12, 1996

VIDEO ADVISORY: V96-24

LAPTOP FLIGHT TRAINER, AIRBORNE TOXIC WASTE RESEARCH ON NTV

On Wednesday NASA Television will air footage and interviews showing how pilots are using laptop computers to learn how to fly advanced commercial aircraft. Also airing Wednesday, will be features on the Airborne Visible and Infra-Red Imaging Spectrometer (AVIRIS), an airborne sensor being used to map a toxic waste site in an effort to save cost and speed clean-up at a Superfund site in Leadville, CO. AVIRIS is being flown aboard a NASA ER-2 high-altitude research aircraft and is used to make measurements related to global climate and environmental change.

Video News Files air at noon, 3 p.m., 6 p.m. and 9 p.m. EST

ITEM #1: PILOT TRAINING ON A LAPTOP
Prototype software program helps pilots to learn to fly using a laptop computer.

ITEM #2: INTERVIEW -- DR. STEPHEN CASNER
Research computer scientist explains the Flight Management System project.

ITEM #3: SUPERFUND SITE CLEAN-UP
Maps produced from NASA airborne sensor help cut cost and speed clean-up of a hazardous waste site in Colorado.

ITEM #4: INTERVIEW -- GREG SWAYZE, U.S. GEOLOGICAL SURVEY
Swayze explains how AVIRIS works to detect acidic mine drainage.

ITEM #5: INTERVIEW-- ROBERT GREEN, JET PROPULSION LABORATORY
NASA expert explains how AVIRIS enables the study of large regions of land and water in ways previously unavailable.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

For Release

March 12, 1996

RELEASE: 96-44

SCIENTISTS RECEIVE MICROGRAVITY RESEARCH GRANTS

NASA has selected 168 scientists from 32 different states to receive grants worth a total of approximately $17 million for conducting ground - and space-based microgravity research.

The investigations will form the foundation of microgravity research by assessing and ultimately understanding the effects of low gravity on physical processes, such as the solidification of metals. This new knowledge is expected to lead to major advances in fluid physics and materials science.

By carefully studying and controlling the processes by which materials are formed, materials scientists can develop metal alloys, semiconductors, ceramics, glasses, and polymers to improve the performance of products ranging from glass and steel to semiconductors and plastics. The fluid and low temperature microgravity physics research can be used by scientists to better understand the formation of weather systems, such as tornadoes and hurricanes, how water seeps through soil and how cracks propagate in metals.

NASA's Office of Life and Microgravity Science and Applications, Washington, DC, received approximately 550 proposals in response to the research announcements. The proposals were peer reviewed by non-NASA scientific and technical experts. The selected proposals represent the following areas: materials science (63), fluid physics (84) and low temperature/laser cooling physics (25).

The list of the grant recipients is available by calling the NASA Headquarters Newsroom at 202/358-1600 or via the Internet at:

ftp://ftp.hq.nasa.gov/pub/pao/pressrel/1996/96-44a.txt

- end -

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

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Dom Amatore
Marshall Space Flight Center, Huntsville, AL
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March 12, 1996

RELEASE: 96-45

RESEARCH ANNOUNCEMENT TO JUMP-START X-34

A forthcoming NASA Research Announcement (NRA) will solicit industry and government proposals aimed at re-structuring the X-34 program allowing for one or more small technology demonstrator vehicles to begin flight tests in 1998.

The original X-34 was to have been a small, reusable commercial launch vehicle as well as a technology test bed for the Agency's Reusable Launch Vehicle activities. The Cooperative Agreement which formed this initial industry-government partnership has been revoked by industry due to their concerns about the commercial viability of the effort.

The intention to issue an NRA by the end of the month was announced today in the "Commerce Business Daily." "This announcement marks an important step in focussing the X-34 program on our top priority of technology demonstration flight tests," said Gary Payton, Director of NASA's Reusable Launch Vehicle Program. "This will allow government and industry to get on with the important task of demonstrating key technologies in the demanding test environments that address tomorrow's reusable space transportation needs," Payton said.

This re-structured technology demonstration program -- not tied to potential commercial applications -- is being planned to bridge the gap between this spring's flight tests of the DC-XA (NASA's Advanced Delta Clipper), and projected flight tests of a larger X-33 demonstrator in the spring of 1999. The X-33 program could lead to a national, industry-led decision, by

-more-

the year 2000, to develop a commercial vehicle early next century which will provide affordable, reliable and reusable access to space. Results of the X-34 program will be shared with industry which is soon to begin development of the X-33.

Plans for the program include launch and landing one or more unmanned, reusable vehicles up to 25 times within a year; powered flights to at least 250,000 feet and capable of attaining 8-times the speed of sound or better; use of advanced thermal protection systems flying subsonically through rain and fog; flights of new technologies that test composite structures, composite tanks, and new integrated avionics; and demonstrations of safe abort and autonomous landing techniques, in high cross winds, utilizing modern landing systems.

The government commitment in the re-structured program is estimated to be approximately $60 million.

Today's Commerce Business Daily announcement is also available through the Internet via the Marshall Space Flight Center Procurement Home Page at URL:

http://procure.msfc.nasa.gov/midrange/presol/notices/notices.html

and the NASA RLV Home Page URL: http://rlv.msfc.nasa.gov

- end -

96-46

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPACE SHUTTLE MISSION STS-76

PRESS KIT
March 1996

Third Space Shuttle - Mir Docking Mission

For Information on the Space Shuttle

Ed Campion Headquarters, Washington, DC	Policy/Management	202/358-1778
Rob Navias Johnson Space Center, Houston, TX	Mission Operations Astronauts	713/483-5111
Bruce Buckingham Kennedy Space Center, FL	Launch Processing KSC Landing Information	407/867-2468
June Malone Marshall Space Flight Center, Huntsville, AL	External Tank/Shuttle Propulsion	205/544-0034
Cam Martin Dryden Flight Research Center, Edwards, CA	DFRC Landing Information	805/258-3448

For Information on STS-76 Experiments & Activities

Mike Braukus Headquarters, Washington, DC	Mir Science	202/358-1979
Debbie Rahn Headquarters, Washington, DC	International Cooperation	202/358-1639
Ray Castillo Headquarters, Washington, DC	MEEP	202/358-4555
Beth Schmid Headquarters Washington, DC	KidSat/SAREX	202/358-1760
Tammy Jones Goddard Space Flight Center, Greenbelt, MD	TRIS	301/286-5566

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GENERAL BACKGROUND

STS-76 PAYLOADS & ACTIVITIES

Cargo Bay Experiments

STS-76 CREW BIOGRAPHIES

RELEASE: 96-46

CONTINUATION OF U.S./RUSSIA SPACE COOPERATION HIGHLIGHTS THIRD SHUTTLE MISSION OF 1996

The first spacewalk by U.S. astronauts while the shuttle is attached to the Russian Space Station Mir and the first American woman to serve as a Mir station researcher will highlight NASA's third shuttle mission of 1996.

The flight, designated mission STS-76, is the third of nine planned Space Shuttle-Mir link ups between 1995 and 1998, including rendezvous, docking and crew transfers, which will pave the way toward assembly of the International Space Station beginning in November 1997.

The STS-76 crew is commanded by Kevin P. Chilton, making his third Shuttle flight. The pilot for the mission, Richard A. Searfoss, is making his second flight. There are four mission specialists assigned to the flight. Ronald M. Sega, serving as the Payload Commander and Mission Specialist-1 is making his second flight. Mission Specialist-2 is Richard Clifford who is making his third flight. Linda Godwin, serving as Mission Specialist-3, is also making her third flight. Mission Specialist-4, Shannon Lucid, is flying in space for the fifth time. Lucid will remain aboard the Mir station after Atlantis undocks, becoming the first American woman to serve as a Mir crew member. She will remain aboard the orbiting station until Atlantis again docks to Mir in early August.

Launch of Atlantis is currently targeted for no earlier than March 21, 1996 at approximately 3:35 a.m. EST from Kennedy Space Center's Launch Complex 39-B. The actual launch time may vary a few minutes based on calculations of the Mir's precise location in space at the time of launch, due to Shuttle rendezvous phasing requirements. The available launch period or "window" to launch Atlantis, is approximately 6-10 minutes each day.

The STS-76 mission is scheduled to last approximately 9 days, 4 hours, 29 minutes. Docking with Mir is set for the third day of the mission. An on time launch and nominal mission duration would result in a landing on March 30 at 8:04 a.m. EST.

STS-76 rendezvous and docking activities with the Mir actually begin with the precisely timed launch of Atlantis, setting it on a course to meet the orbiting station. Over the next two days, periodic firings of Atlantis' small thruster engines will gradually bring the Shuttle closer to Mir. Docking with the Mir station is planned to take place 43 hours into the flight.

On the sixth day of the mission, Godwin and Clifford are scheduled to perform a six-hour spacewalk while Atlantis is docked to the Mir. They will attach four experiments individually onto handrails located on the Mir Docking Modules. The experiments, collectively referred to as the Mir Environmental Effects Payload (MEEP), are designed to help characterize the space environment at a 51.6 degree inclination, the same inclination at which the International Space Station will be built. The MEEP experiments will be retrieved during a spacewalk 18 months later. Godwin and Clifford also will work with common U.S./Russian EVA hardware such as safety tethers and foot restraints and will retrieve a video camera mounted on Mir. Their EVA also represents one in a series aimed at testing equipment and procedures which may be implemented during assembly and maintenance of the International Space Station.

During the five days of docked operations, many of the planned joint activities will center around the middeck and SPACEHAB module. Equipment being flown in the module includes items to be used during the EVA, supplies for the Russians such as food, water, batteries, navigation equipment, clothing and U.S. supplies to support Dr. Lucid's stay aboard Mir. The SPACEHAB module also will contain an ESA-sponsored science experiment called Biorack, which is a variety of experiments that addresses investigations in both life and microgravity sciences.

Two payloads will provide students the opportunity to participate with the mission. A new payload known as KidSat will make its first flight and will provide students in grades K-12 access to real-time images of the Earth from their own observing instruments in space. The Shuttle Amateur Radio Experiment (SAREX), which has flown on several flights, allows students to talk with STS-76 crewmembers via ham radio. During the communication sessions, students can talk to the crew about mission activities and learn about how individuals live and work in space.

The STS-76 mission will be the 16th flight of Atlantis and the 76th for the Space Shuttle system.

end of general release

Media Services Information

NASA Television Transmission

NASA television is available through the Spacenet-2 satellite system. Spacenet-2 is located on Transponder 5, at 69 degrees West longitude, frequency 3880.0 MHz, audio 6.8 MHz.

The schedule for television transmissions from the Orbiter and for mission briefings will be available during the mission at Kennedy Space Center, FL; Marshall Space Flight Center, Huntsville, AL; Dryden Flight Research Center, Edwards, CA; Johnson Space Center, Houston, TX; and NASA Headquarters, Washington, DC. The television schedule will be updated to reflect changes dictated by mission operations.

Television schedules also may be obtained by calling COMSTOR at 713/483-5817. COMSTOR is a computer data base service requiring the use of a telephone modem. A voice update of the television schedule is provided daily at noon Eastern time.

Status Reports

Status reports on countdown and mission progress, on-orbit activities and landing operations will be produced by the appropriate NASA newscenter.

Briefings

A mission press briefing schedule will be issued prior to launch. During the mission, status briefings by a flight director or mission operations representative and when appropriate, representatives from the payload team, will occur at least once each day. The updated NASA television schedule will indicate when mission briefings are planned.

Internet Information

The NASA Headquarters Public Affairs Internet Home Page provides access to the STS-76 mission press kit and status reports. The address for the Headquarters Public Affairs Home Page is:
http://www.nasa.gov/hqpao/hqpao_home.html

Informational materials, such as status reports and TV schedules, also are available from an anonymous FTP (File Transfer Protocol) server at **ftp.hq.nasa.gov/pub/pao**. Users should log on with the user name "anonymous" (no quotes), then enter their E-mail address as the password. Within the /pub/pao directory there will be a "readme.txt" file explaining the directory structure.

Pre-launch status reports from KSC are found under **ftp.hq.nasa.gov/pub/pao/statrpt/ksc**, and mission status reports can be found under **ftp.hq.nasa.gov/pub/pao/statrpt/jsc**. Daily TV schedules can be found under **ftp.hq.nasa.gov/pub/pao/statrpt/jsc/tvsked**.

Access by CompuServe

Users with CompuServe accounts can access NASA press releases by typing "GO NASA" (no quotes) and making a selection from the categories offered.

STS-76 QUICK LOOK

Launch Date/Site:	March 21, 1996/KSC Launch Pad 39-B
Launch Time:	3:35 AM EST
Launch Window:	Between 6-10 minutes
Orbiter:	Atlantis (OV-105), 16th flight
Orbit Altitude/Inclination:	160 nautical miles, 213 n.m. for docking/51.6 degrees
Mission Duration:	9 days, 4 hours, 29 minutes
Landing Date:	March 30, 1996
Landing Time:	8:04 AM EST
Primary Landing Site:	Kennedy Space Center, FL
Abort Landing Sites:	Return to Launch Site - KSC Transoceanic Abort Sites - Zaragoza, Spain Moron, Spain Ben Guerir, Morocco Abort-Once Around - Kennedy Space Center
Crew:	Kevin Chilton, Commander (CDR) Rick Searfoss, Pilot (PLT) Ron Sega, Payload Cmdr./Mission Specialist 1 (MS 1) Rich Clifford, Mission Specialist 2 (MS 2) Linda Godwin, Mission Specialist 3 (MS 3) Shannon Lucid, Mission Specialist 4 (MS 4, Ascent-Docking)
Mir 21 Crew:	Yuri Onufrienko, Commander Yuri Usachev, Flight Engineer (Lucid joins the Mir 21 crew after docking for approximately 142 days aboard Mir)
EVA Crew :	Linda Godwin (EV1), Rich Clifford (EV2)
Cargo Bay Payloads:	SPACEHAB-Single Module Orbiter Docking System MEEP
In-Cabin Payloads:	KidSat SAREX

Shuttle Abort Modes

Space Shuttle launch abort philosophy aims toward safe and intact recovery of the flight crew, Orbiter and its payload. Abort modes for STS-76 include:

- Abort-To-Orbit (ATO) -- Partial loss of main engine thrust late enough to permit reaching a minimal 105-nautical mile orbit with the orbital maneuvering system engines.

- Abort-Once-Around (AOA) -- Earlier main engine shutdown with the capability to allow one orbit of the Earth before landing at the Kennedy Space Center, FL.

- Transoceanic Abort Landing (TAL) -- Loss of one or more main engines midway through powered flight would force a landing at either Ben Guerir, Morocco; or Moron, Spain.

- Return-To-Launch-Site (RTLS) -- Early shutdown of one or more engines, and without enough energy to reach a TAL site, would result in a pitch around and thrust back toward Kennedy until within gliding distance of the Shuttle Landing Facility.

MISSION SUMMARY TIMELINE

Flight Day One:
Launch/Ascent
OMS-2 Burn
SPACEHAB Activation
Mir Rendezvous Burns

Flight Day 2:
SPACEHAB Operations and Biorack
Rendezvous Tool Checkout
EVA Tool Transfer
KidSat Setup
EMU Checkout
SAFER Checkout
Rendezvous Burns

Flight Day 3:
Rendezvous
Docking
Hatch Opening/Welcoming Ceremony/Gift Exchange
Crew Transfer
Logistics Transfers

Flight Day 4:
SPACEHAB Operations and Biorack
Mir Photography Experiments
Logistics and Water Transfers

Flight Day 5:
SPACEHAB Operations and Biorack
Logistics Transfers
Joint Crew News Conference
EVA Middeck Preparations
Hatch Closure
Cabin Depress

Flight Day 6:
EVA Preparations
EVA (6 hours)
Cabin Repress
Wireless Network Experiment
Hatch Opening

Flight Day 7
Logistics Transfers
SPACEHAB Operations and Biorack
Farewell Ceremony
Final Hatch Closure

Flight Day 8:
Undocking and Mir Flyaround
Separation Maneuver
KidSat Setup
Transfer Item Stowage
EVA Tool Stowage

Flight Day 9:
Cabin Stowage
Flight Control System Checkout
Reaction Control System Hot-Fire
SPACEHAB Operations and Partial Deactivation

Flight Day 10:
Final SPACEHAB Deactivation
Entry Review
Deorbit Prep
Deorbit Burn
Entry
KSC Landing

STS-76 ORBITAL EVENTS SUMMARY
(Based on a Mar. 21, 1996 Launch)

EVENT	MET	TIME OF DAY (EST)
Launch	0/00:00	3:35 AM, Mar. 21
OMS-2	0/00:43	4:18 AM, Mar. 21

Exact times for major events on STS-76 and other Phase 1 Shuttle-Mir docking missions will not be determined until after launch because of the rendezvous requirements needed for Atlantis to reach the Mir space station. Docking with the Mir is predicted to occur about 43 hours after launch. The spacewalk outside Mir is scheduled to begin at an approximate Mission Elapsed Time of 4/22:35. Undocking is predicted to occur at an approximate Mission Elapsed Time of 6/17:34.

Deorbit Burn	9/03:29	7:04 AM, Mar. 30
KSC Landing	9/04:29	8:04 AM, Mar. 30

PAYLOAD AND VEHICLE WEIGHTS

Vehicle/Payload	Pounds
Orbiter (Atlantis) empty and 3 SSME's	152,246
Orbiter Docking System	4,016
SPACEHAB Module and Tunnel Adapter	10,387
Risk Mitigation Experiments for Mir Environment (RME's)	709
KidSat	4
SAREX	28
Shuttle System at SRB Ignition	4,509,746
Orbiter Weight at Landing	246,335

CREW RESPONSIBILITIES

Payloads	Prime	Backup
SPACEHAB	Sega	Godwin
Biorack	Sega	Godwin
Rendezvous	Chilton, Searfoss	Clifford
Orbiter Docking System	Clifford	Godwin
KidSat	Godwin	Searfoss
Russian Language	Sega	----------
EVA	Godwin (EV 1)	Clifford (EV 2)
Intravehicular Crewmember	Sega	--------
Space Vision System	Clifford	Searfoss
Dewar Transfer	Clifford	Searfoss
Battery Transfer	Clifford	Searfoss
Gyrodyne Transfer	Clifford	Searfoss
Water Transfer	Searfoss	Clifford
Frozen Sample Transfer	Sega	Godwin
SAREX	Godwin	Searfoss

Developmental Test Objectives/Detailed Supplementary Objectives/Risk Mitigation Experiments

DTO 301D:	Ascent Structural Capability Evaluation
DTO 307D:	Entry Structural Capability
DTO 312:	ET TPS Performance
DTO 648:	Electronic Still Photography Test
DTO 671:	EVA Hardware for Future Scheduled EVA Missions
DTO 700-5:	Trajectory Control Sensor
DTO 700-10:	Orbiter Space Vision System Video Taping
DTO 700-13:	Signal Attenuation Effects of ET During Ascent
DTO 805:	Crosswind Landing Performance
DTO 1118:	Photographic and Video Survey of Mir Space Station
DTO 1210:	EVA Operations Procedures
DSO 331:	LES and Sustained Weightlessness on Egress Locomotion
DSO 483:	Back Pain Pattern in Microgravity
DSO 487:	Immunological Assessment of Crewmembers
DSO 489:	EVA Dosimetry Evaluation
DSO 901:	Documentary Television
DSO 902:	Documentary Motion Picture Photography
DSO 903:	Documentary Still Photography
RME 1301:	Mated Shuttle and Mir Structural Dynamics Test
RME 1302:	Mir Electric Fields Characterization
RME 1304:	Mir/Environmental Effects Payload
RME 1306:	Mir Wireless Network
RME 1310:	Shuttle/Mir Alignment Stability Experiment
RME 1315:	Trapped Ions in Space Experiment

Mir Rendezvous and Docking

STS-76's rendezvous and docking with the Russian Space Station Mir begins with the precisely timed launch of Atlantis on a course for the station. Over the next two flight days, periodic small engine firings will gradually bring Atlantis to a point eight nautical miles behind Mir on docking day, the starting-point for a final approach to the station.

Mir Rendezvous -- Flight Day 3

About two hours before the scheduled docking time on Flight Day Three of the mission, Atlantis will reach a point about eight nautical miles behind the Mir space station and fire a Terminal Phase Initiation (TI) burn, beginning the final phase of the rendezvous. Atlantis will close the final eight nautical miles to Mir during the next orbit. As Atlantis closes in, the Shuttle's rendezvous radar system will begin tracking Mir and providing range and closing rate information to Atlantis. Atlantis' crew also will begin air-to-air communications with the Mir crew.

As Atlantis closes in on the Mir, the Shuttle will have the opportunity for four small successive engine firings to fine-tune its approach using its onboard navigation information. Identical to the two prior Mir dockings, Atlantis will aim for a point directly below Mir, along the Earth radius vector (R-Bar), an imaginary line drawn between Mir's center of gravity and the center of Earth. Approaching along the R-Bar, from directly underneath the Mir, allows natural forces to brake Atlantis' approach more so than would occur along a standard Shuttle approach from directly in front of Mir. During this approach, the crew will also use a handheld laser ranging device to supplement distance and closing rate measurments made by Shuttle navigational equipment.

The manual phase of the rendezvous will begin just as Atlantis reaches a point about a half-mile below Mir. Commander Kevin Chilton will fly the Shuttle using the aft flight deck controls as Atlantis begins moving up toward Mir. During the approach up the R-Bar, Chilton will perform a 180 degree yaw rotation to align the Shuttle with the Mir station. Because of the approach along the R-Bar, from underneath Mir, Chilton will have to perform very few braking firings. However, if such firings are required, the Shuttle's jets will be used in a mode called "Low-Z", a technique that uses slightly offset jets on Atlantis' nose and tail to slow the spacecraft rather than firing jets pointed directly at Mir. This technique avoids contamination of the space station and its solar arrays by exhaust from the Shuttle steering jets.

Using the centerline camera fixed in the center of the Atlantis' docking mechanism, Chilton will center Atlantis' mechanism with the docking module mechanism on Mir, continually refining this alignment as he approaches within 300 feet of the station.

At a distance of about 30 feet from docking, Chilton will stationkeep momentarily to adjust the docking mechanism alignment, if necessary. The crew will use ship-to-ship communications with Mir to inform the two cosmonauts of the shuttle's status and to keep them informed of major events, including confirmation of contact, capture and the conclusion of damping. Damping, the halt of any relative motion between the two spacecraft after docking, is performed by shock absorber-type springs within the docking device.

Once Atlantis is ready to undock from Mir, the initial separation will be performed by springs that will gently push the shuttle away from the docking module. Both the Mir and Atlantis will be in a mode called "free drift" during the undocking, a mode that has the steering jets of each spacecraft shut off to avoid any inadvertent firings.

Once the docking mechanism's springs have pushed Atlantis away to a distance of about two feet from Mir, Chilton will turn Atlantis' steering jets back on when the docking devices will be clear of one another and fire the shuttle's jets in the Low-Z mode to begin very slowly moving away from Mir.

Atlantis will continue away from Mir to a distance of about 600 feet, where Searfoss will begin a flyaround of the station. At that distance, Atlantis will circle Mir twice before firing its jets again to depart the vicinity of the station.

STS-76 Extravehicular Activity

STS-76 crew members Dr. Linda Godwin (EV1) and Rich Clifford (EV2) will perform an approximately six-hour spacewalk on flight day six of the mission to install the Mir Environmental Effects Payload (MEEP) on the exterior of the Mir's docking module and to evaluate new spacewalking equipment. The spacewalk will be the first ever performed from the docked Space Shuttle and Mir complex.

The Simplified Aid For EVA Rescue (SAFER), first test-flown on shuttle mission STS-64 in September 1994, will be worn by Godwin and Clifford and will be used only for a contingency. Spacewalking equipment to be evaluated consists of several new tether designs with hooks that can be attached to both space shuttle handrails and to Mir space station handrails. Normal space shuttle tether hooks are not large enough to be connected to the Mir handrails. A U.S. camera mounted on the exterior of the Mir docking module, used during STS-74 to align the module as it was permanently docked to the Mir, also will be removed by the spacewalkers and returned to Earth for reuse.

While Godwin and Clifford are performing the work in the cargo bay and on the Mir docking module, Mission Specialist Ron Sega will serve as

the Intravehicular (IV) crewmember, coordinating the tasks from inside Atlantis' crew cabin. Prior to beginning the spacewalk, the hatches of both Atlantis and the Mir will be closed at the docking mechanism. A hatch at the end of the shuttle tunnel adapter also will be closed, allowing only the airlock and tunnel to be depressurized.

All of the shuttle crew members will be in Atlantis' crew cabin for the duration of the spacewalk, and all Mir crew members, including Mir-21 crewmember astronaut Shannon Lucid, will be aboard the Mir.

Mir Environmental Experiment Payload

Godwin and Clifford will remove the four MEEP experiment containers from their stowed positions along the right and left sides of Atlantis' cargo bay. Each experiment container will be attached to handrails on the exterior of the docking module using special clamps installed by Godwin and Clifford. After each experiment package is clamped to the appropriate module handrails, the spacewalkers will unfold the packages to expose the experiment panels.

Common US/Russian EVA Tools

The tools to be evaluated are called Common US/Russian EVA tools and include safety tethers with larger hooks to allow attachment to the Mir's exterior handrails and a new foot restraint also designed to allow attachment to the Mir fixtures.

Docking Module Television Camera Removal

To remove the Docking Module television camera, the spacewalkers will use cable cutters to sever the cable connecting the camera and then turn a knob that releases the camera's mounting. The camera will be tethered and taken aboard Atlantis.

Simplified Aid For EVA Rescue

The Simplified Aid for EVA Rescue (SAFER) is a small, self-contained, propulsive backpack device that can provide free-flying mobility for a spacewalker in an emergency. It is designed for self-rescue by a spacewalker in the event the shuttle is docked to the Mir and thus unable to retrieve a detached, drifting astronaut.

SAFER is attached to the spacesuit's Portable Life Support System backpack, and is, in essence, a scaled-down, miniature version of the Manned Maneuvering Unit backpack flown aboard shuttle missions in 1984. It is designed for emergency use only, however, without backup systems built in. SAFER's propulsion is provided by 24 fixed-position thrusters that expel nitrogen gas and have a thrust of .8 lbs. each. Stowed in the crew cabin for launch and landing, SAFER's nitrogen supply can be recharged in orbit from

the shuttle's nitrogen system. SAFER's three-pound supply of nitrogen can provide only a total 10-foot-per-second change in velocity for the operator before it is exhausted. Its attitude control system includes an automatic attitude hold and six degrees of freedom. A 28-volt battery pack for SAFER can be replaced in orbit.

MIR SCIENCE

Earth orbit places humans in a most unusual environment with reduced gravitational forces, a near-absolute vacuum, a broad spectrum of radiation, and wide temperature extremes. Scientific research has always been one of the most important objectives for both the American and Russian space programs and the long-term research platform supplied by the Mir complex allows extensive studies in fundamental physics, chemistry, human and plant biology, and technology, as well as investigations directed toward understanding processes used on Earth. A carefully planned program of studies designed to use the capabilities of Mir during the next few years will be an integral part of the evolutionary process into understanding the effects of long-duration microgravity on biological and physical processes. Scientists have the opportunity to better understand the space environment, study and learn to cope with the effects that it has on humans, and increase their scientific knowledge and technological developments for implementation on the International Space Station and here on Earth.

The commercial and technology development program will evaluate advanced technologies and manufacturing techniques. Space environmental effects on physical dynamics will also be studied. The Mir station will be used as a test bed to study several major technology disciplines: structures, materials, biotechnology, and physical processes.

Earth sciences research will be performed in ocean biochemistry, land surface hydrology, meteorology, and atmospheric physics and chemistry. Observation and documentation of transient natural and human-made phenomena will be accomplished with the use of passive microwave radiometers, a visible region spectrometer to study the ocean, and a side-looking radar.

Life sciences and fundamental biology applications include investigations that evaluate new technologies for life support systems which enhance the capabilities for on-orbit environmental monitoring. These include characterizing the biological and chemical aspects of the research environment of Mir, and expanding the knowledge of space human factors and extravehicular activity.

International Space Station Risk Mitigation consists of several technology demonstrations associated with human factors and maintenance of crew health and safety aboard the space station. By fully evaluating the Mir interior and exterior environments, such as audible noise levels, radio frequency interference, crew-induced forces to structures, particle impacts on the station, and docking configuration stability, information can be gathered for the improved design of the International Space Station.

Microgravity research has the general goal of advancing scientific understanding and providing value on Earth through research in

biotechnology, fluid physics, combustion, and materials science. The ambient acceleration and vibration environment of Mir will be characterized for benefit to both research and engineering programs.

Space science research will collect interstellar and interplanetary particles in space to further our understanding of the origin and evolution of planetary systems and life on Earth.

Most of the Mir 21/NASA 2 research will be conducted on the Mir. Some of the shuttle missions will carry SpaceHab and provide shuttle-based facilities and Middeck lockers for short duration experiments.

SPACEHAB MODULE

STS-76 will begin a series of Shuttle-Mir missions that will carry a SPACEHAB module onboard. Over the course of these missions, SPACEHAB modules will carry a mix of supplies and scientific equipment to and from Mir.

On STS-76, the SPACEHAB module will be in a single module configuration, similar to previous SPACEHAB missions. In addition to the Spacelab short tunnel and airlock which have flown on SPACEHAB single module missions before, there will be an extended tunnel beyond the airlock and a 19-inch tunnel extension built by SPACEHAB, Inc. to position the SPACEHAB module in the optimal point in the Shuttle's cargo bay. Because the single module will be positioned further aft than on previous missions, the module will be able to carry up to 4,800 pounds of useable payload up to and back from Mir.

Equipment that will be carried in the SPACEHAB module on STS-76 can be categorized in the following five types:

1. Russian Logistics
2. Extravehicular Activity (EVA) Tools
3. International Space Station Risk Mitigation Experiments (RME)
4. American Logistics
5. Science and Technology Experiments.

1. Russian Logistics: A double rack will be dedicated to some of the Russian logistics, including the gyrodyne and the individual equipment and seat liner (IESL) kit. The gyrodyne will be transferred by the crew to and from Mir to replace a used gyrodyne. The IESL kit will be transferred by the crew to Mir to be available for use by Mission Specialist Shannon Lucid in case of an emergency return to Earth in a Soyuz capsule. Three Russian storage batteries which were returned to Earth from Mir on STS-71 will be mounted on the aft bulkhead of the SPACEHAB module. During docked operations, the crew will remove the batteries and transfer them to Mir. Numerous Russian logistics items totaling approximately1,900 lbs. will be carried in the SPACEHAB soft stowage system. Items include food and water containers, clothing and sleeping articles, personal hygiene equipment, a current transformer, and a Mir supplemental kit. These items will be transferred to Mir by the crew.

2. EVA Tools: Several soft bags will be used to carry EVA support equipment. The EVA tools will support Detailed Test Objectives (DTOs) as listed. The equipment will include Waist Tethers (DTO 672), Push Lock Tether Tools (DTO 671, 672) and a 35mm Camera and Accessories (Tools for 96 Bolts). Other Detailed Science Objectives (DSOs) also will be supported by the EVA equipment, including DSOs 486, 489 and 494.

3. RME: The Risk Mitigation Experiments hardware will be carried in soft stowage bags and consist of the following items: Mir Electric Field Characterization (MEFC) hardware, and the Mir Environmental Effects Payload (MEEP) attachment brackets.

- The MEFC experiment will collect data on the internal and external radio interference in the 400 MHz to 18 GHz frequency band. The hardware consists of a radio frequency spectrum analyzer and power cable, an orbiter window antenna, and a payload general support computer. The experiment hardware will be removed from the SPACEHAB module. Experiment operations will be performed on the shuttle's flight deck then returned to the module for return to Earth.

- The MEEP experiment is designed to collect samples of orbital and micrometeoroid debris and will be attached to Mir during an EVA by the crew. The MEEP attachment brackets will be clamped to external handrails on Mir and will remain there after their installation during the mission.

4. American Logistics: About 15 full water bags supplied through the shuttle's water system will be transferred to Mir. New film also will be swapped for film already shot aboard Mir, and the docking module light and television camera will be returned to Earth.

5. Science and Technology Experiments:

a. Biorack: The European Space Agency's Biorack experiment will share a double rack with the Life Sciences Laboratory Equipment Refrigerator/Freezer (LSLE) in the SPACEHAB module. The Biorack is a multi-purpose facility designed to enable biological investigations on plants, tissues, cells, bacteria, and insects during spaceflight. Its main purpose is to investigate the effects of microgravity and cosmic radiation, particularly the effects of high-energy (HZE) particles, on the development of these species. Eleven experiments will be conducted during the mission: three from the U.S., three from France, three from Germany, one from Switzerland and one from the Netherlands. Over 21 hours of crew time will be spent with the Biorack.

The equipment which comprises the Biorack includes incubator units, a glovebox, an experiment power switching unit, an external power data panel, and one soft stowage locker. In addition to the rack-mounted hardware, the Biorack also will use three middeck lockers, each containing a passive thermal conditioning unit (PTCU).

The incubator units provide controlled temperature environments for certain payload element containers during Biorack operations while on orbit. The glovebox is a containment facility to be used for specimen manipulations. The glovebox provides a means to contain accidental spillage of any toxic materials and to prevent contamination of biological samples

when the covers of the payload element containers are removed for operations. Payload element containers come in two sizes, one about the size of cigarette packs, and another about the size of one-pint ice cream cartons. The PTCU provides controlled temperature environments for the payload element containers when active temperature conditioning cannot be provided. Biorack will require the partial use of one LSLE freezer to contain payload element samples for on-orbit processing and for descent.

The LSLE will be operated in the freezer mode at -22 degrees C on orbit and for the descent.

Biorack will be a combination of nine different payload elements to be performed throughout the mission. High-energy atomic number charged particles (HZE) radiation will be studied to explicitly correlate biological responses with naturally occurring HZE particles. Also, the study of microgravity potential modifications of biological responses to radiation will be analyzed.

Studies also will include the effect of microgravity on bone loss by investigating alterations in select gene expression patterns, the continuing studies of microgravity on gravity sensing, and response in Hematopoietic cells. Studies on PKC, which is an important enzyme in intra-cellular signaling pathways, will be analyzed under microgravity conditions. The signaling pathways appear to be sensitive to gravity in a number of cell types.

The effects of using centrifuges as 1-g references have demonstrated sedimentation and convection may affect cells on a macroscopic scale by the formation of oxygen and nutrient gradients. A Biorack payload element will study this phenomena which implies that a 1-g reference centrifuge may not necessarily be an optimal control for all types of space experiments. An analysis on the effects of the transfer from 1-g to microgravity on the polarity of statocytes and the role of actin filaments on the positioning of treated and untreated roots will be conducted during the mission. Additional plant experiments will study the effects of microgravity on cell wall regeneration, cell division, and growth and differentiation of plants from protoplasts.

A dosimetry experiment will be flown to document the radiation environment inside the Biorack facility and other locations inside the SPACEHAB module and the middeck. The data will provide a radiation baseline for Biorack payload elements and in addition, the payload element will be monitoring the SPACEHAB module along with new orbit inclination and altitude.

b. Life Sciences Laboratory Equipment Refrigerator/Freezer (LSLE R/F): The LSLE R/F is a vapor compression refrigerator which will be carried in a double rack (with the Biorack) in the SPACEHAB module. The LSLE R/F has flown five times on board the Shuttle. Its internal volume is 2.5 ft 3 in., and can accept a variety of racks, shelves and containers, and maintains internal

temperatures ranging from +10 degrees C to -22 degrees C. On STS-76, the LSLE R/F will carry processed samples from the Biorack as well as the Johnson Space Center Frozen Stowage experiment which includes blood, urine and saliva samples from the Mir-21 crew. These samples will be analyzed on Earth for evidence of accelerated renal stone development and protein metabolism in microgravity.

c. Mir Glovebox Stowage (MGBX): The MGBX will be carried in soft stowage bags to replenish hardware for the MGBX located on Mir. Equipment included in the MGBX includes the Combustion Experiments Parts Box to be used with the candle flames in microgravity experiment and the Forced Flow Flamespread Test, the Passive Accelerometer, the Protein Crystal Growth Experiment, and the Protein Crystal Growth Thermal Enclosure System Ancillary.

d. Queen's University Experiment in Liquid Diffusion (QUELD). QUELD will be carried in a soft stowage bag and middeck locker.

e. High Temperature Liquid Phase Sintering (LPS)

Developed by the University of Alabama at Huntsville's (UAH) Consortium for Materials Development of Space--one of NASA's 11 Centers for the Commercial Development of Space--the Liquid Phase Sintering (LPS) experiment will be carried to the Mir space station aboard STS-76 and will be returned to U.S. experimenters for analysis following the planned August Shuttle-Mir docking mission of STS-79.

The experiment will use the Optizon furnace aboard Russia's Mir space station. A variety of metals will be bonded together in a series of experiments over a two week period on Mir. Researchers are using a process called Liquid Phase Sintering to create these metal composites. By conducting these technology experiments in space, new insights may be gained concerning industrial needs and operations on Earth.

As one example, Liquid Phase Sintering experiments in microgravity may provide greater understanding on how metals bond. One area which could benefit from improved metal composites is the tool industry.

Mir Environmental Effects Payload (MEEP)

MEEP, managed by NASA's Langley Research Center, Hampton, VA, will study the frequency and effects of space debris striking the Mir space station. MEEP will study both human-made and natural space debris, capturing some debris for later study. It will be attached to the Mir shuttle docking module during a spacewalk by mission specialists Linda M. Godwin and Michael (Rich) Clifford.

MEEP also will expose selected and proposed International Space Station materials to the effects of space and orbital debris. Because the International Space Station will be placed in approximately the same Earth orbit as Mir, flying MEEP aboard Mir will give researchers an opportunity to test materials for the International Space Station in a comparable orbital position.

MEEP consists of four separate experiments. The Polished Plate Micrometeoroid and Debris experiment is designed to study how often space debris hit the station, the sizes of these debris, the source of the debris, and the damage the debris would do if it hit the station. The Orbital Debris Collector experiment is designed to capture orbital debris and return them to Earth to determine what the debris are made of and their possible origins.

The Passive Optical Sample Assembly I and II experiments consist of various materials that are intended for use on the International Space Station. These materials include paint samples, glass coatings, multi-layer insulation and a variety of metallic samples.

MEEP will remain attached to Mir until late 1997, when the four experiment containers will be retrieved by another space shuttle crew (STS-86) and returned to Earth for study. The data will be studied to determine what kind of debris hit the space station and how those contaminants can actually collect on some of the different surfaces of a space station, affecting its surfaces and long-term performance.

The four MEEP experiments are contained in four Passive Experiment Carriers (PEC). Each of the four PECs consists of a sidewall carrier for attachment to the payload bay of Atlantis (STS-76), a handrail clamp for attachment to the Mir shuttle docking module, and an experiment container to house the individual experiment.

KidSat Project

KidSat is a three-year pilot project that will fly on the shuttle once a year. This is the project's first flight. KidSat seeks to give middle school students the opportunity to participate in space exploration. KidSat will enable students to configure their own payload of digital video and a camera for flight on the Shuttle, command the camera from their classrooms, and download their images of Earth in near real-time. Images will be used as the basis for a variety of classroom discoveries, including history, geography, geology, physics, oceanography, mathematics and current events, and as a means of exploring their own planet using NASA data.

KidSat will be powered on and tested at three participating schools on flight day two. Images will be posted on the KidSat home page. Interested public school districts, teachers, and students may view the images and information provided by students during the mission via the World Wide Web site: http://www.jpl.nasa.gov/kidsat/

Participating Schools

For the first flight, three pilot districts were selected on the basis of three criteria: 1) urban schools; 2) proximity to one of the institutional partners; 3) previous involvement with Space Shuttle missions. Each district selected a classroom to initiate the pilot program: Samuel Gompers Secondary School, San Diego, CA (7-8th grade); Washington Accelerated Learning Center, Pasadena, CA (5th grade) Buist Academy, Charleston, SC (5-8th grade).

Institutional Partners

The KidSat concept was inspired by a group of high school students working on a Shuttle mission as part of the Jet Propulsion Laboratory's (JPL) collaboration with The Johns Hopkins University Institute for Academic Advancement of Youth (IAAY). The program was developed by JPL, IAAY and the Univeristy of California, San Diego (UCSD). JPL has the lead role in the project management of KidSat, the development of the remote sensing instruments and cameras, and the data system. The UCSD provides the mission operations for this program, and IAAY is leading the curriculum development, teacher training, and evaluation. Significant support from the Johnson Space Center also is a key element of this project, and the first digital still camera is a Kodak DC460C. The project is supported by NASA's Office of Human Resources and Education, Washington, DC, with support from NASA's Office of Mission to Planet Earth, Office of Space Flight, and the Office of Space Science, Washington, DC.

Shuttle Amateur Radio EXperiment (SAREX)

U.S. students will have a chance to speak via amateur radio with astronauts aboard STS-76. Ground-based amateur radio operators ("hams") will be able to contact shuttle astronauts through a direct voice ham radio link as time permits.

Shuttle Pilot Richard A. Searfoss (call sign KC5CKM) and mission specialists Linda Godwin (N5RAX), Ron Sega (KC5ETH) and Shannon Lucid (call sign pending) as well as Commander Chilton will talk with students in five U.S. schools using ham radio.

Students in the following schools will have the opportunity to talk directly with orbiting astronauts for approximately 4 to 8 minutes:

- Artesia Public Schools, Artesia, NM
- Troy Middle School, Troy, TX
- S.J. Davis Middle School, San Antonio, TX
- Bethlehem Central Senior High School, Delmar, NY
- University of Colorado, Colorado Springs, CO

The radio contacts are part of the SAREX (Shuttle Amateur Radio EXperiment) project, a joint effort by NASA, the American Radio Relay League (ARRL), and the Radio Amateur Satellite Corporation (AMSAT).

The amateur radio station at the Goddard Space Flight Center,Greenbelt, MD, (WA3NAN), will operate around the clock during the mission, providing SAREX information, and retransmitting live Shuttle air-to-ground audio. The Goddard amateur radio club's planned HF operating frequencies are:

3.860 MHz 7.185 MHz
14.295 21.395
28.650

Information about orbital elements, contact times, frequencies and crew operating schedules will be available during the mission. Current Keplerian elements to track the Shuttle and SAREX specific information are available from the following sources:

- NASA Spacelink computer information system
  BBS: (205) 895-0028
  Internet, Telnet, FTP, Gopher: spacelink.msfc.nasa.gov
  WWW: http://spacelink.msfc.nasa.gov

- NASA SAREX WWW Home Page: http//www.nasa.gov/sarex/sarex_mainpage.html

- American Radio Relay League
  Telephone: (860) 594-0301
  BBS: (860) 594-0306
  WWW: http://www.arrl.org

- AMSAT
  Telephone: Frank Bauer (AMSAT/NASA) (301) 286-8496
  WWW: http://www.amsat.org

- NASA Johnson Space Center Amateur Radio Club
  BBS: (713) 244-5625

- Goddard Amateur Radio Club
  BBS: (301) 286-4137
  WWW: http://garc.gsfc.nasa.gov/www/garc-home-page.html

STS-76 SAREX Frequencies

IMPORTANT NOTE: Since the flight is a Shuttle-Mir docking mission, and SAREX and Mir amateur radio stations usually share the same downlink frequency (145.55), the SAREX Working Group has decided to make the following SAREX frequency changes for the STS-76 mission:

Worldwide downlink frequency is 145.84MHz.

The voice uplink frequencies are:
144.45, 144.47 MHz

Note: Ham operators should not transmit on the Shuttle's downlink frequency. The downlink is your receiving frequency. The uplink is your transmitting frequency. In addition, the astronauts will not favor any one of the above frequencies. Therefore, the ability to talk with an astronaut depends on selecting one of the above frequencies chosen by the astronaut.

Trapped Ions in Space (TRIS)

The Naval Research Laboratory's (NRL's) Trapped Ions in Space (TRIS) experiment will fly as a Get Away Special payload on STS-76. TRIS will measure a recently-discovered belt of energetic cosmic ray nuclei trapped in Earth's magnetic field to quantify radiation hazards in space and lead to a better theoretical understanding of how these cosmic ray nuclei have become trapped in the Earth's magnetic field.

So-called "anomalous cosmic rays", which originate in the nearby interstellar medium, form the radiation belt which TRIS will observe. These trapped anomalous cosmic rays, say the researchers, have sufficient energy to pose a potential radiation hazard to some lightly shielded electronic systems planned for the International Space Station and perhaps to astronauts during spacewalks in certain parts of the orbit.

Although the existence of this radiation belt was predicted by scientists in 1977, it was not confirmed until 1991, when an NRL-led team of U.S. and Russian scientists compared satellite data from both countries. Since 1992 trapped anomalous cosmic rays have also been observed by experiments aboard NASA's Solar, Anomalous, and Magnetospheric Particle Experiment (SAMPEX) satellite at an altitude of about 372 miles. At present, however, there is insufficient theoretical understanding of trapped anomalous cosmic rays to extrapolate from the SAMPEX observations down to altitudes of 217-279 miles, where the Russian Space Station Mir is located and where the ISS will operate. Scientists will be able to compare simultaneous observations from TRIS and SAMPEX to bridge this gap.

TRIS, which previously flew on a space shuttle mission in 1984, measures and identifies cosmic ray nuclei using polycarbonate detectors, including some of the same type that are routinely used in the astronauts' dosimeter badges. Ionizing particles produce trails of radiation damage as they pass through these detectors. After return from space, the detectors are chemically etched in the laboratory to reveal the damage trails, which are then measured with high-precision microscopes. The atomic numbers, energies, and arrival directions of the cosmic ray nuclei are determined from these measurements.

TRIS was built by NRL's Space Science Division. The flight is being sponsored by the U.S. Air Force Space Test Program office at the Johnson Space Center.

STS-76 / MIR-21 CREW BIOGRAPHIES

Note: Complete biographical information on all NASA astronauts is available through the NASA Shuttle Web home page on: **http://shuttle.nasa.gov.**

STS-76 CREW

Kevin Chilton (Col., USAF) was born November 3, 1954 in Los Angeles, CA. He received a bachelor of science degree in engineering science in 1976 from the U.S. Air Force Academy and a master of science degree in mechanical engineering from Columbia University on a Guggenheim Fellowship in 1977. He became an astronaut in 1988 and served as pilot on his first two Shuttle flights, STS-49 in 1992 and STS-59 in 1994.

Richard Searfoss (Lt. Col., USAF) was born on June 5, 1956 in Mount Clemens, MI, but considers Portsmouth, NH, to be his hometown. He received a bachelor of science degree in aeronautical engineering from the USAF Academy in 1978 and a master of science degree in aeronautics from the California Institute of Technology on a National Science Foundation Fellowship in 1979. Searfoss was selected to join the astronaut corps in 1990 and served as pilot on his first Shuttle flight, STS-58 in 1993.

Ronald Sega (Ph.D.) was born December 4, 1952 in Cleveland, OH, but considers Northfield, OH, and Colorado Springs, CO, to be his hometowns. He received a bachelor of science degree in mathematics and physics from the U.S. Air Force Academy in 1974, a master of science degree in physics from Ohio State in 1975 and a doctorate in electrical engineering from the University of Colorado in 1982. Sega became an astronaut in 1991 and served as a mission specialist on his first space flight, STS-60 in 1994.

M. Richard Clifford (Lt. Col., USA, ret.) was born October 13, 1952 in San Bernardino, CA, but considers Ogden, UT, to be his hometown. He received a bachelor of science degree from the United States Military Academy, West Point, New York, in 1974 and a master of science degree in aerospace engineering from the Georgia Institute of Technology in 1982. Clifford was selected as an astronaut in 1990 and has flown as a mission specialist on two previous Shuttle flights, STS-53 in November 1992 and STS-59 in April 1994.

Linda Godwin (Ph.D.) was born July 2, 1952 in Cape Girardeau, MO, but considers Jackson, MO, to be her hometown. She received a bachelor of science degree in mathematics and physics from Southeast Missouri State in 1974 and a master of science degree and a doctorate in physics from the University of Missouri in 1976 and 1980. Godwin began working at NASA in 1980 and became an astronaut six years later. She has flown in space twice, on STS-37 in April 1991 and STS-59 in April 1994.

Shannon Lucid (Ph.D.) was born January 14, 1943 in Shanghai, China but considers Bethany, OK, to be her hometown. She received a bachelor of science degree in chemistry from the University of Oklahoma in 1963 and a master of science and doctor of philosophy degrees in biochemistry from the University of Oklahoma in 1970 and 1973, respectively. Lucid was selected as an astronaut in 1978 and has served as a mission specialist on four previous Shuttle flights, STS 51-B in 1985, STS-34 in 1989, STS-43 in 1991 and STS-58 in 1993. At the conclusion of Shuttle-Mir joint-docked operations, Lucid will remain aboard Mir serving as a station researcher. She will return to Earth when Atlantis again docks to Mir during mission STS-79 in August 1996.

MIR-21 CREW

Yuri Onufrienko (Mir-21 Commander) - was born February 6, 1961 in the village of Ryasnoye, Zolochevsk district, Kharlov region, Russia. He graduated from the V.M. Komarov Eisk Higher Military Aviation School for Pilots in 1982 with a pilot-engineer's diploma. He was assigned to the Gagarin Cosmonaut Training Center in 1989. From September 1989 to January 1991 he attended the general space training course. From April 1991 to February 1994 he trained for space flight as part of the test-cosmonaut group in the Mir orbital station program. From February 1994 to February 1995 he trained for flight as backup crew commander for Mir-18 and Mir-Shuttle programs. From March to June 1995 he trained for flight on the Mir station for Mir-19 and Mir-Shuttle programs as the commander of the backup crew. Since June 1995, he trained for space flight in the Soyuz-TM transport vehicle and Mir station as commander of the main crew for Mir-21. Onufrienko along with Mir-21 Flight Engineer Yuri Usachev were launched aboard a Soyuz-TM transport vehicle on the start of the Mir-21 mission on February 21, 1996. Onufrienko and Usachev docked to the Mir station two days later. The Mir-21 mission is Onufrienko's first space flight mission.

Yuri Usachev (Mir-21 Flight Engineer) - was born October 9, 1957 in the city of Donetsk, Rostov Region, Russia. He graduated from the Moscow Aviation Institute in 1985. Since 1985 he has worked at the RSC Energia. He joined the cosmonauts of RSC Energia in 1989. From September 1989 to January 1991 he attended the general space training course at the Gagarin Cosmonaut Training Center. From April 1991 to August 1992 he trained for space flights as a member of the test-cosmonaut group in the Mir station program. In 1992 and 1993 he trained for flight on the Mir complex in the Mir-13 program as flight engineer of the backup crew. From February to June 1993 he trained for flight on the Mir complex in the programs Mir-14 and Altaire (France) as flight engineer of the backup crew. From August 1993 to January 1994 he trained in the Mir-15 program as flight engineer of the main crew. From January to July 1994 he flew on the Mir complex for 182 days. From April to June 1995 he trained for flight on the Mir station as flight engineer of the backup crew in the Mir-19 and Mir-Shuttle programs. Since June 1995, he trained for space flight in the

Soyuz-TM transport vehicle and Mir station as flight engineer of the main crew for Mir-21. Usachev along with Mir-21 Commander Yuri Onufrienko were launched aboard a Soyuz-TM transport vehicle on the start of the Mir-21 mission on February 21, 1996. They docked to the Mir station two days later. The Mir-21 mission is Usachev's second space flight mission.

News Release

National Aeronautics and
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For Release

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March 13, 1996

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RELEASE: 96-47

NASA DEVELOPS NEW LAPTOP PILOT TRAINING TOOL

A NASA scientist has developed a prototype of a software program which helps pilots learn how to fly advanced commercial aircraft using a laptop computer.

Developed by Dr. Steve Casner, a researcher at the Ames Research Center, Mountain View, CA, the program mimics the flight management system of an automated "glass" cockpit and allows flight training professionals to program their own learning materials and exercises for their students. The program operates on a Macintosh computer.

"This is basically an electronic tutor that supports pilots in their training and in the ongoing learning process," Casner said. "Because of the decreasing size and increasing power of small computers, we are able to incorporate a tremendous amount of information into a small package and provide more learning opportunities. These opportunities can take place anywhere and at any time -- whenever the need for further information or practice arises."

Casner spent two years working to emulate the program found in the aircraft's flight management computer. He received assistance in this effort from Smiths Industries, Boeing Commercial Aircraft Co., the Federal Aviation Administration, as well as several U.S. airline carriers.

The software program features five windows: a control/display unit, mode control panel, two maps showing the aircraft's lateral track and its vertical track, and a flight mode enunciator showing which flight systems are currently controlling the airplane.

-more-

In addition, there is a section to the right of the control/display unit for inputting text and carrying on a dialogue with the pilots. The software program is designed to utilize video, audio, and film clips to illustrate various flight sequences.

"When we want to demonstrate something, small versions of charts, videos and photos can be programmed into the laptop," Casner said. "My intent was to provide a platform that can be expanded by flight instructors and other pilots to meet their training needs.

"As airplane systems become more complex, the training challenges for airline companies and pilots increase," Casner said. "Our goal is to investigate new technologies and techniques that can help meet those challenges. Tools such as the laptop training device give pilots an opportunity to learn more on their own, to complement traditional classroom and flight simulation training."

Casner has demonstrated the new program to several major U.S. airlines and received inquiries from foreign carriers. He plans to test the program in a major airline's pilot training program.

The laptop pilot training tool is an example of transferring NASA research and technology to the aviation industry. "Typically, once a technology is developed and evaluated, it is then provided to the industry for broad use," Casner said.

Casner also plans to create a training program for university students who are studying to become pilots. He hopes to produce a textbook and CD ROM introducing students to the modern flight management system. "This should make information on modern flight management systems more available to a broad student population," Casner said.

"Many of the pilots of tomorrow are coming from universities where they have studied aviation for four years," he said. "We want to provide a mechanism for them to learn about this new breed of airplane equipped with a flight management system. With this learning opportunity, they will arrive at an airline with more knowledge and expertise."

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March 13, 1996

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RELEASE: 96-48

NASA AIRBORNE SENSOR AIDS SUPERFUND SITE CLEAN-UP

Maps produced from a NASA airborne sensor are cutting costs and helping to speed the clean-up of hazardous waste at a Superfund site in Leadville, CO.

Several federal agencies, including the Bureau of Reclamation, the Environmental Protection Agency and the U.S. Geological Survey (USGS), are using the maps to find sources of acid mine drainage and heavy-metal contamination at the California Gulch Superfund Site. The contamination is the result of more than 130 years of mining activities associated with the Leadville Mining District, according to Felix W. Cook, Sr., director of the Technical Service Center at the Bureau of Reclamation, Denver, CO.

The maps were produced by the USGS using data from NASA's Airborne Visible and Infra-Red Imaging Spectrometer (AVIRIS) which was developed and is managed by the Jet Propulsion Laboratory, (JPL), Pasadena, CA. The AVIRIS instrument flies aboard a NASA ER-2 high-altitude research aircraft.

While being carried 12 miles above sea level at a speed of 450 miles per hour, the instrument can take approximately 7,000 measurements per second. Earth scientists use AVIRIS to make measurements related to global climate and environmental change research in ecology, geology, oceanography, snow hydrology and cloud and atmospheric studies.

"This technique of imaging spectroscopy represents a fundamental new way of doing remote-sensing. We are measuring in detail how light is absorbed or reflected by various materials on the Earth's surface and that gives us an accurate picture of what those materials on the ground are made of. Once we know where the materials are, we can begin to make decisions based on those maps," said Robert Green, the AVIRIS experiment scientist at JPL.

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"The imaging spectroscopy mineral mapping has allowed us to identify potential contaminating sources as small as individual mine dumps for evaluation," Cook said. "Based on our recent experience, the Bureau of Reclamation anticipates that many future hazardous clean-up efforts throughout the United States, especially at large sites, should use AVIRIS to produce relatively inexpensive thematic site maps to aid in remediation."

An analysis program that recognizes the spectral signature of the contaminants on the ground has been developed by the USGS to construct mineral maps from the AVIRIS data. "AVIRIS data are like a treasure chest of scripts in an unknown language -- totally unreadable to the untrained observer," said Gregg Swayze, a geophysicist at the USGS. "The imaging analysis program is like a Rosetta stone, a key to that language by which the AVIRIS data can be interpreted and profited from."

The mineral maps have helped officials save roughly $500,000 and about a year's time in identifying the areas in need of attention.

"NASA's AVIRIS program has enabled more money to be used for actually cleaning up the hazardous mine waste materials currently contaminating this site," Cook said. "In addition, the speed with which the AVIRIS data can be processed, mapped, and integrated into our system has enabled us to complete the site data development and analysis process about a year ahead of schedule, saving additional money and time."

Reclamation officials believe the AVIRIS data mineral mapping could be used for site investigations on many of the hazardous waste sites now included on the Environmental Protection Agency's National Priorities List.

The AVIRIS instrument is managed by JPL for NASA's Office of Mission to Planet Earth, Washington, DC. The Mission to Planet Earth is a long-term, coordinated program to study the Earth's air, water, land and life as a global environmental system.

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March 13, 1996

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RELEASE: 96-49

LAWRENCE TO REPLACE PRECOURT AS NASA MANAGER IN RUSSIA

Astronaut Wendy B. Lawrence (Commander, USN) will replace Charles J. Precourt (Lt. Col., USAF), as the NASA manager of operational activities at Star City, Russia.

As Director of Operations, Russia, Lawrence will support training and preparations of NASA astronauts at the Gagarin Cosmonaut Training Center (GCTC), Star City. She also will be the primary link between NASA and the GCTC management, coordinating all training and other operations involving NASA or contractor personnel in Star City.

Lawrence, the sixth astronaut to serve in this rotational assignment will continue to establish operational and managerial relationships with Star City management and Russian cosmonauts. These relationships are pivotal to successful, long-term joint operations involving NASA, the Russian Space Agency and GCTC.

Lawrence will leave for Russia this month and join fellow astronauts John E. Blaha (Colonel, USAF, Ret.), Jerry M. Linenger (Commander, Medical Corps, USN), C. Michael Foale, Ph.D., and James S. Voss (Col., USA), who are training in Star City. Precourt will return to the Johnson Space Center to begin training as commander of the sixth Shuttle/Mir docking mission (STS-84).

Lawrence, 36, was born in Jacksonville, FL. For complete biographical information on Lawrence and other astronauts, see the Internet home page at:
http://www.jsc.nasa.gov/Bios/

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News Release

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For Release

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March 14, 1996

MEDIA ADVISORY

NASA RELEASES STRATEGY FOR THE FUTURE

NASA has released its blueprint for the future -- "The NASA Strategic Plan." The plan builds upon previous strategies and creates a clear direction for America's aeronautics and space programs. In addition, the plan defines NASA's vision, including present, midterm and future mission goals, expected outcomes and enterprises. It will be used as NASA's strategy to provide a common basis for the Agency's management to make decisions in implementing programs and deploying resources.

Copies of the plan are available by calling the NASA Headquarters Newsroom at 202/358-1600 or via the Internet at URL:

http://www.hq.nasa.gov/office/nsp/NSPTOC.html

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Video Advisory

National Aeronautics and
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March 14, 1996

VIDEO ADVISORY: V96-26

ROLL-OUT OF DELTA CLIPPER, RUNWAY FRICTION TESTS ON NTV FRIDAY

On Friday NASA TV will air footage showing NASA's DC-XA "Delta Clipper," a next-generation reusable launch vehicle. The Delta Clipper is designed to fly into space, deliver a payload and then return to Earth for a vertical landing. The Delta Clipper was made by McDonnell Douglas, St. Louis, MO. Also airing on Friday will be a feature and an interview on how NASA aircraft tests have been conducted to study runway friction and landing behaviors during diverse weather conditions. The studies are an important part of an effort to increase aircraft efficiency and safety.

Reairing on Friday will be features on Sunday's upcoming roll-out of a Russian Tu-144 supersonic aircraft in Russia. NASA, in partnership with U.S. and Russian aircraft industries, will be using the Russian aircraft for flight research that will lead to the development of a High Speed Civil Transport.

Video News Files air at noon, 3 p.m., 6 p.m. and 9 p.m. EST

ITEM #1: DELTA CLIPPER ROLLS OUT
Experimental reusable rocket rolls out in preparation for May flight tests.

ITEM #2: GET A GRIP
Runway friction tests to enhance safety and relieve airport congestion during bad weather.

ITEM #3: INTERVIEW -- THOMAS YAGER, SENIOR RESEARCH ENGINEER
Yager explains the importance of the runway friction tests.

ITEM #4: SUPERSONIC FLIGHT ANIMATION
Animation of supersonic passenger jet.

ITEM #5: RUSSIAN SUPERSONIC PASSENGER JET
Preview of March 17 roll-out of supersonic research aircraft in Russia.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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RELEASE: 96-50

U.S.-RUSSIAN FLIGHT RESEARCH PROGRAM BEGINS WITH SST ROLL-OUT

A modified Russian supersonic passenger jet will roll-out of its hangar on March 17 to symbolize the start of a joint six-month flight research program between NASA, a U.S. industry team and the Russian aerospace industry.

The Russian Tupolev Design Bureau, Tu-144LL, a supersonic flying laboratory, will carry experiments in support of NASA's High-Speed Research (HSR) program. The HSR program, begun in 1990, teams NASA with U.S. industry to conduct research on technology that may allow the future development of a new High-Speed Civil Transport (HSCT) at the turn of the century. The U.S. industry team for the Tu-144 project is led by Boeing with support from McDonnell Douglas, Rockwell, Pratt & Whitney and General Electric.

The Tu-144LL project was enabled by an agreement signed in June 1993 in Vancouver, Canada, by Vice President Gore and Russian Prime Minister Vicktor Chernomyrdin. This is the most significant joint aeronautics program to date between the two countries.

"Using the Tu-144LL is a perfect fit between our needs and their capabilities. It's a model for cooperative technology programs with Russia," said Alliance Development Office director Louis J. Williams. "This effort will provide up-to-date information on the "real world" conditions that a supersonic airliner operates in - data we wouldn't otherwise be able to obtain easily."

-more-

The project calls for the Russian-made aircraft to make 32 flights in six months beginning this spring. All flights will be in Russia. Six NASA/U.S. industry experiments will be flown at various times throughout the period. Two more experiments will be conducted on the ground using a Tu-144 engine.

The Tu-144 can fly at Mach 2.3, or 2.3 times the speed of sound - approximately 1,500 mph. Its speed and availability make it the perfect vehicle for NASA to conduct studies of high-temperature structures and materials, acoustics, supersonic aerodynamics and supersonic propulsion.

To prepare the Tu-144 for flight, its original engines were removed in favor of larger and newer NK-321 augmented turbofan engines, originally produced for the Tupolev Tu-160 Blackjack bomber. The engines are one of many upgrades and modifications. The airliner's passenger seats were removed to make room for the experiments' instrumentation and data collection. The work is being done by the Tupolev Design Bureau, which developed the Tu-144. All Tu-144LL flights will originate from the Zhukovsky Airfield in Russia.

A total of 17 Tu-144s were manufactured, including a prototype and five "D" models. The aircraft chosen for the flight test program is one of the D models, which have slightly different specifications than a production model. The world's first supersonic transport flight was made by a Tu-144 prototype on Dec. 31, 1968. The sleek, needle-nosed aircraft was originally designed for service in the Russian airline industry. A Tu-144 first flew passengers on a flight from Moscow to Alma-Ala, Kazakhstan on Nov. 1, 1977.

As envisioned by NASA's HSR program, the next-generation HSCT would fly 300 passengers at 2.4 times the speed of sound - crossing the Pacific or Atlantic in less than half the time presently required on modern subsonic, wide-bodied jets - at an affordable ticket price, estimated at less than 20 percent above comparable subsonic flights, and be environmentally friendly. The technology to make the HSCT possible is being developed by an unprecedented teaming of major U.S. aerospace companies in the multi-year HSR program.

The NASA HSR team is led by the HSR Program Office, located at Langley Research Center, Hampton, VA, and is supported by NASA's Dryden Flight Research Center, and the Ames and Lewis Research Centers. The major U.S. corporate partners in the HSR program are Boeing Commercial Airplane Group, McDonnell Douglas Aerospace, Rockwell North American Aircraft Div., General Electric Aircraft Engines and Pratt & Whitney.

- end -

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March 15, 1996

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NOTE TO EDITORS: N96-19

NASA AND MCDONNELL DOUGLAS UNVEIL NEWEST X-PLANE

The first ever display of the newest X-plane, the X-36, a remotely piloted tailless research aircraft will take place at 11 a.m. EST Tuesday, March 19, at McDonnell Douglas, St. Louis, MO.

The X-36 is a tailless design for a stealthy fighter aircraft that could dramatically change the look of future jet fighters. This scaled, remotely piloted aircraft concept has no vertical tail, yet is expected to demonstrate the feasibility of future fighters achieving maneuverability superior to today's best fighters. By eliminating the need for these tail control surfaces, future tailless fighter aircraft will weigh less, fly farther and be able to survive better than today's fighters. This revolutionary new design is the result of technical breakthroughs made by a dedicated team of engineers from NASA Ames Research Center, Mountain View, CA, and McDonnell Douglas Aerospace.

NASA Administrator Daniel S. Goldin and McDonnell Douglas President and Chief Executive Officer Harry Stonecipher will unveil this revolutionary experimental aircraft.

Camera crews are welcome to use company-provided audio and video feed, or shoot their own footage. B-roll and press photos will be available after the ceremony.

Media wishing to attend the ceremony should contact Ellen LeMond-Holman at 314/232-6496 or Barbara Anderson at 314/234-4187.

-end-

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For Release

March 15, 1996

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NOTE TO EDITORS: N96-20

SHUTTLE MANAGERS CLOSE O-RING ISSUE, LAUNCH DATE SET

Following a presentation by Solid Rocket Motor (SRM) managers to NASA senior management, Space Shuttle Atlantis has been given approval to proceed for launch on March 21 at 3:35 a.m. EST from Kennedy Space Center's Launch Complex 39-B.

The meeting today was a follow-up to the STS-76 Flight Readiness Review held Monday at Kennedy. Because of the need to resolve an anomaly experienced to the wiper o-ring in the nozzle-to-case joint for SRM's used in the STS-75 launch, NASA managers held a special topic telecon today. At the conclusion of the telecon, NASA managers agreed that there were no flight safety concerns and that Atlantis was ready for launch.

"After reviewing both flights and test data, and after an extensive analysis, we have concluded that the nozzle-to-case joint is robust and sturdy and that the joint's design is safe to fly," said George Abbey, Director, Johnson Space Center, who chaired the telecon.

The available launch period, or "window," to launch Atlantis is approximately seven to ten minutes each day. The STS-76 mission is scheduled to last approximately nine days. Docking with Mir will occur about 43 hours after launch. An on-time launch and nominal mission duration would have Atlantis and crew returning to Earth on March 30 with a landing at KSC's Shuttle Landing Facility at approximately 8:04 a.m. EST.

The STS-76 mission will be the 16th mission for Atlantis and the 76th for the Space Shuttle system.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

Jim Cast
Headquarters, Washington, DC
(Phone: 202/358-1779)

March 15, 1996

Dom Amatore
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0031)

RELEASE: 96-51

DELTA-CLIPPER ROLLS OUT; FLIGHT TESTS TO BEGIN IN MAY

The four-story-high, newly refurbished NASA Delta Clipper vehicle rolled out of McDonnell Douglas' facility in Huntington Beach, CA, today for transport to New Mexico in preparation for flight tests beginning in May.

Dubbed the DC-XA, for Delta Clipper-Experimental Advanced, the unpiloted, single-stage vehicle is being developed under a cooperative agreement between NASA and its industry partner to demonstrate new technologies needed for a reliable, affordable reusable launch vehicle that could be operated commercially by American industry with NASA as one of its customers.

"This is a radically different vehicle from the DC-X that flew last year in tests conducted for the Air Force," said DC-XA project manager Dan Dumbacher at NASA's Marshall Space Flight Center, Huntsville, AL. "Many technology innovations have been introduced to the vehicle and when we test fly it this spring we'll be writing a new page in the history of space transportation systems."

The DC-XA will be the first rocket ever to fly with a composite hydrogen tank. The tank, built by McDonnell Douglas, is made of graphite-epoxy and is 1,200 pounds lighter than the aluminum tank used in the DC-X. Achieving that kind of weight reduction is essential to the development of a single-stage-to-orbit reusable launch vehicle. The composite tank successfully withstood cryogenic testing under simulated flight conditions at Marshall in December. The series of flight tests planned for the DC-XA at the Army's White Sands Missile Range in New Mexico will demonstrate the hydrogen tank's

-more-

performance as well as that of other new advanced technology components of the vehicle in a real world operating environment, according to Dumbacher. These components include a Russian-built aluminum-lithium alloy liquid oxygen tank; a composite intertank to connect the hydrogen and oxygen tanks; and an auxiliary propulsion system consisting of a composite liquid hydrogen feedline, a composite liquid hydrogen valve and a liquid-to-gas conversion system in the flight reaction control system. The U.S. Air Force's Phillips Laboratory at Kirtland Air Force Base, New Mexico, will manage flight test operations.

The DC-XA, X-34 and X-33 comprise NASA's Reusable Launch Vehicle Technology Program, a partnership among NASA, the Air Force and private industry to develop a new generation of single-stage-to-orbit launch vehicles. The knowledge and experience acquired in developing and test flying the DC-XA will be used by NASA and an industry partner in development of the X-33, a larger advanced technology demonstrator. NASA will select its industry partner for that vehicle later this year, with test flights planned for 1999. The X-34, a small technology vehicle to be developed and flight tested by 1998, also will contribute valuable data to the X-33 program, which in turn could lead to a national, industry-led decision to develop a commercial reusable launch vehicle early next century.

NASA's investment in the DC-XA program is $20 million for hardware and $30 million for integration. In addition to Marshall, New Mexico's USAF Phillips Lab and U.S. Army White Sands Missile Range, as well as NASA's Langley Research Center, Hampton, VA, and Dryden Flight Research Center, Edwards, CA, are supporting DC-XA.

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News Release

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FAA Headquarters, Washington, DC
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For Release
March 15, 1996

RELEASE: 96-52

WINTER RUNWAY SAFETY SUBJECT OF NEW STUDY

The safety of aircraft takeoffs and landings will be enhanced with the knowledge and operational procedures expected from a new study of winter runway friction now underway.

The five-year government/industry study, called the Joint Winter Runway Friction Measurement Program, is being led by NASA and Transport Canada with support from the Federal Aviation Administration (FAA). Also participating are organizations and equipment manufacturers from Europe and several Scandinavian countries.

The study will include braking tests with instrumented aircraft and ground vehicles in the U.S. and Canada. Results are expected to enhance safety for all ground operations and help relieve airport congestion during bad weather. Results also will help industry develop improved tire designs, better chemical treatments for snow and ice control, more reliable ground vehicle friction measuring systems and runway surfaces that minimize bad weather effects.

Flight crew recognition of less-than-acceptable reported runway friction conditions prior to the "go/no go" or the "land/go around" decision point is one of the near-term program goals.

NASA's B-737 research aircraft and Canada's National Research Council Falcon-20 aircraft completed a week-long series of landing tests earlier this month on ice- snow- and slush-covered runways at the Jack Garland Airport in North Bay, Ontario, Canada, about 200 miles north of Toronto.

-more-

Surface conditions were artificially varied to expand the range of data collected. Many different runway friction-measuring ground vehicles -- vans, trailers and modified cars -- took readings with continuous and fixed slip devices under similar runway conditions for comparison with each other and with the braking performance of the two instrumented aircraft.

Winter runway evaluations also are planned at the Brunswick Naval Air Station, Maine. Water contamination studies are planned at NASA's Wallops Flight Facility, Wallops Island, VA, and the FAA Technical Center in New Jersey.

"Data from the program will be used to quantify exactly how much improvement has been made in measuring runway friction since we performed similar tests with the FAA a decade ago. We hope to learn enough over the course of the study to confidently recommend international guidelines for aircraft and airport ground operations in winter weather, said Thomas Yager, lead NASA engineer on the project.

Broad-based changes in the industry since the 1980's strongly suggested a follow-up to the first NASA-FAA study, conducted between 1983 and 1988. Improved measurement equipment, computer software and test procedures need to be evaluated. Data is also needed on new anti- and de-icing chemicals, water/slush drag effects on new aircraft types and tire construction effects on hydroplaning.

The study also was suggested by strong international support for developing a standardized set of guidelines for runway friction measurement and reporting. In spite of advances in technology and operational procedures, safe winter operations remain a challenge for airport operators, air traffic controllers, airlines and pilots who must coordinate their efforts under rapidly-changing weather conditions.

Complicating the winter weather picture is that criteria for safe operations on a given runway snow condition differ from airport to airport, due to differences in grooving and pavements. Obtaining data relating various winter runway friction numbers to aircraft stopping distance requirements would be a significant step toward the development and adoption of standardized guidelines or tables to be used by pilots.

NASA, the FAA and Transport Canada have cooperated in several ground vehicle and instrumented aircraft studies aimed at improving aircraft ground performance in bad weather. NASA and the FAA worked together as early as the 1950's to establish early slush depth criteria for runway operations. A spin-off from later NASA aircraft hydroplaning studies resulted in the widespread practice of grooving automotive highways to improve tire traction during rainstorms.

In a modern spin-off application, much of the equipment being used to monitor runways is or will be used to measure highway pavement friction performance. In areas with high accident rates, pavement textures can be modified based on readings from ground friction measurement vehicles to improve the safety of automotive travel.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

March 15, 1996

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RELEASE: 96-53

HUBBLE SERVICING MISSION COMMANDER, PILOT NAMED

U.S. Navy Commander Kenneth D. Bowersox and Scott J. "Doc" Horowitz, Ph.D. (Lt. Colonel, USAF) have been named to command and pilot, respectively, the second Space Shuttle mission to service the Hubble Space Telescope scheduled for early next year.

They join Payload Commander Mark C. Lee (Colonel, USAF), Gregory J. Harbaugh, Steven L. Smith and Joseph R. Tanner who were named in May 1995 as the spacewalkers for the mission. Steven A. Hawley, Ph.D., who will serve as the flight engineer and primary remote manipulator system operator, was named to the crew in February.

The 10-day STS-82 mission currently includes four planned spacewalks. The four extravehicular activity crewmembers will alternate on the spacewalks to accomplish a number of equipment changeouts and upgrades on the telescope. Major equipment changeouts include two science instruments and a data interface unit. The instruments are the Near Infrared Camera Multi-Object Spectrometer and the Space Telescope Imaging Spectrograph.

Bowersox, 39, considers Bedford, IN, his hometown. Horowitz, 38, just completed his first Shuttle mission (STS-75) and considers Thousand Oaks, CA, his hometown.

For complete biographical information on these and other astronauts, see the Internet homepage at address: http://www.jsc.nasa.gov/Bios/

-end-

Video Advisory

National Aeronautics and
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Washington, DC 20546
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For Release

David E. Steitz
Headquarters, Washington, DC
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March 18, 1996

VIDEO ADVISORY: V96-27

SPACE STATION STATUS BRIEFING, FY '97 BUDGET PRESS CONFERENCE, SHUTTLE PREFLIGHT BRIEFING TUESDAY

On Tuesday NASA Television will air an International Space Station status briefing at 2 p.m. EST live from the Johnson Space Center, Houston, TX. The briefing will review the progress of the international cooperative effort.

At 3:30 p.m. EST, NASA TV will air the FY 1997 Budget press conference from NASA Headquarters, Washington. Administrator Daniel S. Goldin will release the President's NASA Budget Request to Congress and take questions from the press. There will be two-way question and answer capability from participating NASA Centers during the press conference.

Following the Budget press conference, at appoximately 4:30 p.m. EST NASA TV will air the STS-76 L-2 preflight briefings from the Kennedy Space Center, FL. Senior mission managers will review the status of Thursday's upcoming flight of the Space Shuttle Atlantis on the third Shuttle-Mir docking mission. Launch of Atlantis is set for 3:35 a.m. EST March 21.

Tuesday's noon video file will air background footage and interviews in preparation for the launch of STS-76, as well as a replay of animation showing the Galileo Probe's entry into Jupiter's atmosphere from last December.

TUESDAY, MARCH 19 NASA TELEVISION SCHEDULE (ALL TIMES EST)

Noon **VIDEO FILE PREVIEWING STS-76 SHUTTLE MISSION**

2 p.m. **INTERNATIONAL SPACE STATION STATUS BRIEFING**
Senior NASA officials review status of International Space Station.

3:30 p.m. **NASA FY 1997 BUDGET PRESS CONFERENCE**
NASA Administrator releases President's FY 1997 NASA Budget.

4:30 p.m. **STS-76 L-2 PREFLIGHT BRIEFINGS**
(approx.) Mission managers preview of Thursday's Space Shuttle flight, live from the Kennedy Space Center, FL.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

News Release

National Aeronautics and
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For Release

March 18, 1996

Douglas Isbell
Headquarters, Washington, DC
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Ann Hutchison
Ames Research Center, Mountain View, CA
(Phone: 415/604-4968)

RELEASE: 96-54

GALILEO SCIENTISTS REPORT CHANGING FINDINGS ABOUT JUPITER

Scientists continuing to analyze information returned by the Galileo atmospheric probe that plunged into Jupiter last December report more surprises about the giant gas planet.

Most significantly, the ratio of the elements that make up 99 percent of the Jovian atmosphere -- helium and hydrogen -- now closely matches that found in the Sun, suggesting that Jupiter's bulk composition has not changed since the planet formed several billion years ago. Estimated amounts of key heavy elements such as carbon and sulfur have increased, but minimal organic compounds were detected, and estimates for Jupiter's wind speeds have climbed still higher.

Probe scientists are reporting these refined results today at the Lunar and Planetary Science Conference in Houston, TX.

The ratio of helium to hydrogen by mass is key to developing theories of planetary evolution. In the Sun, this value is about 25 percent. During a January 1996 press conference, Galileo probe scientists estimated that this number for Jupiter was 14 percent. More comprehensive analysis of results from the probe's helium abundance detector has raised this estimate for Jupiter to 24 percent.

"This increase implies that the amount of helium in the Jovian atmosphere is close to the original amount that Jupiter gathered as it formed from the primitive solar nebula that spawned the planets," according to Galileo probe project scientist Dr. Richard Young of NASA's Ames Research Center, Mountain View, CA.

-more-

"The revised helium abundance also indicates that gravitational settling of helium toward the interior of Jupiter has not occurred nearly as fast as it apparently has on Saturn, where the approximate helium-to-hydrogen ratio is just six percent," said Young.

"This then confirms that Jupiter is much hotter in its interior than its neighbor Saturn, the next largest planet in the Solar System. It also may force scientists to revise their projections for the size of the rocky core believed to exist deep in the center of Jupiter," he said.

The new estimate of the helium-to-hydrogen ratio on Jupiter is supported by analysis of complementary data from the Galileo probe's neutral mass spectrometer.

These new helium results are raising related estimates for the abundances of other key compounds, such as methane. Several heavy elements, including carbon, nitrogen and sulfur, are significantly greater in abundance on Jupiter than in the Sun. "This implies that the influx of meteorites and other small bodies into Jupiter over the eons since its formation has played an important role in how Jupiter has evolved," said Young.

However, minimal organic compounds were detected, indicating that such complex combinations of carbon and hydrogen are rare on Jupiter and that the chances of finding biological activity on Jupiter similar to that found on Earth are extremely remote.

The strong Jovian atmospheric winds continue to exceed expectations. Wind speed estimates announced in January of up to 330 mph have grown to more than 400 mph. The winds persisted far below the one cloud layer detected, strongly suggesting that heat escaping from deep in the planet's interior drives the winds, rather than solar heating. Since all the outer giant planets exhibit strong winds, scientists hope that understanding Jupiter's winds will lead to important new insights into their unusual meteorology, Young said.

The scientists continue to report that the probe apparently entered Jupiter's atmosphere near the southern edge of a so-called infrared hot spot, which is believed to be a region of reduced clouds. "The probe's nephelometer observed only one distinct cloud layer, and it is tenuous by Earth standards. It is likely to be an ammonium hydrosulfide cloud," said Young. Three distinct cloud layers (an upper layer of ammonia crystals, a middle layer of ammonium hydrosulfide, and a thick bottom layer of water and ice crystals) were expected.

Further analysis of probe data has confirmed the preliminary report that the Jovian atmosphere appears to be relatively dry, with much less water than anticipated on the basis of solar composition and predictions from data sent by the Voyager spacecraft that flew by Jupiter in 1979. These studies predicted a water abundance for the planet of twice the solar level (based on the Sun's oxygen content.) Actual probe measurements now suggest an amount of water less than that of the Sun.

Scientists confirmed that the probe's instruments found much less lightning activity on Jupiter per unit area than on Earth. Lightning on Jupiter was found to be about 1/10th of that found on Earth in an area of the same size. "Although we found much less lightning activity, the individual lightning events are about ten times more energetic than similar events on Earth," Young said.

"This is the sort of unique and exciting information that could not have been obtained in any way other than an atmospheric entry probe," Young said. Complete detailed results of the Galileo probe data analysis will be reported in the May 10 issue of *Science* magazine.

The cone-shaped Galileo probe entered the atmosphere of Jupiter on Dec. 7, 1995, at a speed of over 106,000 mph and survived deceleration forces of 228 times Earth's gravity. After deploying a parachute, it relayed data to the Galileo orbiter spacecraft overhead for 57 minutes.

The Galileo orbiter is beginning a two-year, 11-orbit tour of Jupiter and will have its first major encounter with a Jovian moon on June 27 when it flies closely by Ganymede. The orbiter successfully conducted a key engine burn on March 14 to prepare for this encounter.

The Galileo probe project is managed by Ames. Hughes Space and Communications Co., El Segundo, CA, designed and built the probe. Lockheed Martin Hypersonic Systems (formerly General Electric), Philadelphia, built the probe's heat shield. NASA's Jet Propulsion Laboratory, Pasadena, CA, built the Galileo orbiter spacecraft and manages the overall mission.

-end-

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Video Advisory

National Aeronautics and
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Washington, DC 20546
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For Release

March 19, 1996

VIDEO ADVISORY: V96-28

ANCIENT CRATERS, UPCOMING SHUTTLE MISSION PREVIEWS WEDNESDAY

On Wednesday NASA TV will air imagery and an interview examining ancient impact craters in Chad, detected by a spaceborne radar flown aboard the Space Shuttle Endeavour in April and October of 1994 also will be aired. In addition, a replay of animation and still photos of the new X-36 tailless fighter will be shown Wednesday.

In preparation for Thursday's morning launch, NASA Television will air crew interviews, animation and background footage highlighting the STS-76 mission, the third of seven Shuttle-Mir docking missions. Atlantis is due to launch from the Kennedy Space Center, FL, at 3:35 a.m. EST March 21.

Video news files air at noon, 3 p.m., 6 p.m. and 9 p.m. EST

ITEM #1: IMPACT CRATERS FOUND IN CHAD
Spaceborne radar sees impact craters in Chad during Shuttle flights.
ITEM #2: X-36 ANIMATION
ITEM #3: X-36 B-ROLL
ITEM #4: INTERVIEW - DR. LARRY BIRCKELBAW, NASA AMES
ITEM #5: STS-76 ANIMATION
ITEM #6: MIR 21 LAUNCH
ITEM #7: LUCID TRAINING IN RUSSIA
ITEM #9: LUCID INTERVIEW IN RUSSIA
ITEM #9: STUDENTS PREPARE KIDSAT
ITEM #10: INTERVIEW -- KEVIN P. CHILTON, STS-76 COMMANDER
ITEM #10: INTERVIEW -- RICHARD A. SEARFOSS, STS-76 PILOT
ITEM #12: INTERVIEW -- SHANNON W. LUCID, MISSION SPECIALIST
ITEM #13: INTERVIEW -- LINDA M. GODWIN, MISSION SPECIALIST
ITEM #14: INTERVIEW -- MICHAEL R. CLIFFORD, MISSION SPECIALIST
ITEM #15: INTERVIEW -- RONALD M. SEGA, MISSION SPECIALIST

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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Video Advisory

National Aeronautics and
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For Release

David E. Steitz
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March 20, 1996

VIDEO ADVISORY: V96-29

COMET HYAKUTAKE ON NASA TV THURSDAY

On Thursday NASA TV will air animation and background information about next Monday's fly-by of the comet Hyakutake. Hyakutake will pass by Earth at a distance of just over nine million miles, and will be visible throughout North America. If the Space Shuttle is in flight, the Hyakutake feature will be aired at noon and 3:30 p.m. EST during the flight day video highlights. In the event of tonight's scheduled Shuttle launch being delayed, NASA TV will air regular video news files at noon, 3 p.m., 6 p.m. and 9 p.m. EST featuring the entire run list as given below.

ITEM #1: COMET HYAKUTAKE
Comet prepares to fly past Earth next Monday.

ITEM #2: IMPACT CRATERS FOUND IN CHAD
ITEM #3: INTERVIEW -- DR. ADRIANNA OCAMPO
ITEM #4: STS-76 ANIMATION
ITEM #5: MIR 21 LAUNCH
ITEM #6: LUCID TRAINING IN RUSSIA
ITEM #7: LUCID INTERVIEW IN RUSSIA
ITEM #8: STUDENTS PREPARE KIDSAT
ITEM #9: INTERVIEW -- KEVIN P. CHILTON, STS-76 COMMANDER
ITEM #10: INTERVIEW -- RICHARD A. SEARFOSS, STS-76 PILOT
ITEM #11: INTERVIEW -- SHANNON W. LUCID, MISSION SPECIALIST
ITEM #12: INTERVIEW -- LINDA M. GODWIN, MISSION SPECIALIST
ITEM #13: INTERVIEW -- MICHAEL R. CLIFFORD, MISSION SPECIALIST
ITEM #14: INTERVIEW -- RONALD M. SEGA, MISSION SPECIALIST

NOTE: NASA Television has arranged for Hal Weaver of the Hubble Space Telescope Institute to be available for **live interviews to discuss Comet Hyakutake next Monday from 4:45 - 8 p.m. EST.** Stations interested in arranging interviews with Weaver should call 202/358-1730 to reserve time.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

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For Release

March 20, 1996

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Mary Hardin
Jet Propulsion Laboratory, Pasadena, CA
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RELEASE: 96-55

CHAIN OF IMPACT CRATERS SUGGESTED BY SPACEBORNE RADAR IMAGES

A team of scientists believes they have discovered a chain of impact craters in the central African country of Chad that suggests ancient Earth may have been hit by a large, fragmented comet or asteroid similar to the Shoemaker-Levy 9 comet that slammed into Jupiter in 1994.

The craters were discovered in radar images of the Earth taken by the Spaceborne Imaging Radar C/X-band Synthetic Aperture Radar (SIR-C/X-SAR) that flew on the Space Shuttle Endeavour in April and October of 1994. The images reveal two new craters adjacent to a previously known impact site, called Aorounga, in northern Chad. The two new craters still need to be confirmed by fieldwork on the ground.

"The Aorounga craters are only the second chain of large craters known on Earth, and were apparently formed by the break-up of a large comet or asteroid prior to impact," said Adriana Ocampo, a geologist at NASA's Jet Propulsion Laboratory, Pasadena, CA. "With ground confirmation, this second chain will provide valuable data on the nature and origin of small bodies that cross Earth's orbit."

Ocampo is presenting her findings today at the annual Lunar and Planetary Science Conference in Houston, TX.

"The two new craters are the first impact craters discovered in SIR-C data," said Dr. Kevin Pope, a SIR-C team member from Geo Eco Arc Research in La Canada Flintridge, CA. "That shows the power of the SIR-C instrument, because these craters are highly eroded and buried by wind-blown sand. They are hard to see even if you are standing on the ground."

-more-

The most prominent of the craters, called Aorounga South, has been observed in Landsat satellite-based images and Space Shuttle hand-held photos, and has been verified by ground work. The other two craters, Aorounga Central and Aorounga North, have not been scientifically confirmed through fieldwork and that has caused other scientists to view this discovery with some skepticism.

"These could very well be impact structures, but we don't have the kind of evidence we need to catalogue them yet," said Dr. John McHone, a SIR-C science team member from the University of Arizona, who has studied impact craters for more than 20 years.

Ocampo and Pope theorize that the object that created these impact sites was either a comet or asteroid that broke up before it hit the Earth. "The pieces were all similar in size -- less than a mile in diameter -- and the craters are all similar in size -- about seven to ten miles wide," Ocampo said.

Similar chains of equal size craters have also been seen on Jupiter's moon Callisto.

The scientists estimate the Chad impact craters date back about 360 million years, to a time when the Earth was undergoing a period of mass biological extinction. By way of comparison, the impact that scientists believed wiped out the dinosaurs 65 million years ago involved an asteroid or comet 10 times larger than the one that broke up to form the craters in Chad.

"These impacts in Chad weren't big enough to cause the extinction, but they may have contributed to it," Ocampo said. "Could these impacts be part of a larger event? Were they, perhaps, part of comet showers that could have added to the extinction? Little by little, we are putting the puzzle together to understand how Earth has evolved."

The Spaceborne Imaging Radar project is managed by the Jet Propulsion Laboratory for NASA's Office of Mission to Planet Earth, Washington, DC. SIR-C/X-SAR is a joint mission of the United States, German and Italian space agencies.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

Michael Braukus
Headquarters, Washington, DC
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March 20, 1996

RELEASE: 96-56

NASA AWARDS MICROGRAVITY COMBUSTION RESEARCH GRANTS

NASA has selected 20 researchers to receive grants totaling more than $7 million for microgravity combustion research.

Sponsored by NASA's Office of Life and Microgravity Science and Applications, Washington, DC, combustion research involves many important technology applications, including fuel efficient automobiles, pollution control, fire safety and space propulsion. Combustion researchers use the low-gravity environment of space as a tool to gain new insights into these physical and chemical processes.

Seventeen of the grants are for ground-based research, while the remaining three are for flight definition projects. Two of these grants are for continuation of work currently being funded by NASA; the remaining 18 programs represent new research efforts.

The investigators will utilize NASA's microgravity research facilities such as drop tubes, drop towers, aircraft flying parabolic trajectories and sounding rockets, with the flight-definition investigators working toward experiments on a space flight test bed.

NASA received 110 proposals in response to this research announcement. These proposals were all peer reviewed by scientific and technical experts from academia, government and industry. In addition, proposals selected for flight definition were reviewed in terms of engineering feasibility by a team from NASA's Lewis Research Center, Cleveland, OH. The list of the grant recipients follows.

-end-

California
Dr. Fokion N. Egolfopoulos
University of Southern California
Los Angeles, CA

Dr. Carlos Fernandez-Pello
University of California,
Berkeley
Berkeley, CA

Dr. Stephen B. Margolis
Sandia National Laboratories
Livermore, CA

Dr. Benjamin D. Shaw
University of California, Davis
Davis, CA

Connecticut
Dr. M.B. Long
Yale University
New Haven, CT

Illinois
Dr. Siavash H. Sohrab
Northwestern University
Evanston, IL

Massachusetts
Dr. Jack B. Howard
Massachusetts Institute of
Technology
Cambridge, MA

Maryland
Dr. Kathryn M. Butler
National Institute of Standards
& Technology
Gaithersburg, MD

Dr. Jose L. Torero
University of Maryland
College Park, MD

Michigan
Dr. Arvind Atreya
The University of Michigan
Ann Arbor, MI

Dr. Gerard M. Faeth
University of Michigan
Ann Arbor, MI

Missouri
Dr. Richard L. Axelbaum
Washington University
St. Louis, MO

New Jersey
Dr. Edward L. Dreizin
AeroChem Research
Laboratories, Inc.
Princeton, NJ

New Mexico
Dr. Daniel J. Kane
Southwest Sciences, Inc.
Santa Fe, NM

Ohio
Dr. Uday Hegde
NYMA, Inc.
Cleveland, OH

Dr. Fletcher J. Miller
Case Western Reserve
University
Cleveland, OH

Dr. Vedha Nayagam
Analex Corporation
Brook Park, OH

Dr. Howard Pearlman
NASA Lewis Research Center
Cleveland, OH

Pennsylvania
Dr. Gary A. Ruff
Drexel University
Philadelphia, PA

Virginia
Dr. H.K. Chelliah
University of Virginia
Charlottesville, VA

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March 21, 1996

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James Wilson
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RELEASE: 96-57

NASA TO OBSERVE AND PUBLISH IMAGES OF COMET HYAKUTAKE

NASA is conducting a variety of activities designed to study the approaching Comet C/1996 B2 Hyakutake and will share this information, and on-going amateur and student observations of the comet, with the general public.

Discovered on January 30 by Japanese amateur comet hunter Yuji Hyakutake using powerful binoculars, the comet is expected to be as bright or brighter than the stars of the Big Dipper. The comet will make its closest approach to Earth on March 25 at a distance of about 9.3 million miles. It should be visible (weather and light pollution permitting) as a dimly glowing cloud in the northern night sky to the left of the handle of the Big Dipper, as seen from North America.

Several NASA spacecraft, including the Hubble Space Telescope, will attempt to take images of Comet Hyakutake.

Hubble has an especially rare and challenging task. Astronomers say it is unlikely such a comet will ever come this close to Earth again during Hubble's planned operational lifetime. Since Hubble is not actively controlled from the ground and the comet's position is not precisely known, viewing the speeding visitor will be especially tricky. The telescope will be preprogrammed to point at a selected spot in the sky where the comet will be at a specific time.

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Planned Hubble science observations of Comet Hyakutake include high-resolution imagery and ultraviolet spectroscopy. Near the time of the comet's closest approach, Hubble should be able to see details as small as four miles across. Astronomers also hope to see jets of dust emerging from the comet's nucleus.

NASA's recently launched Near Earth Asteroid Rendezvous (NEAR) spacecraft is scheduled to take images of the comet as a calibration exercise. Although NEAR offers a different vantage point from Hubble, its camera was not designed to image objects at such large distances.

Several NASA-supported ground-based observatories also will be studying the comet during late March and in April as the comet approaches perihelion (its closest distance from the Sun.)

NASA's Infrared Telescope Facility (IRTF) on Mauna Kea, HI, will dedicate several days of observing time to study the release of dust and ice grains from the nucleus of the comet. These ices are composed primarily of water. Spectral observations of the molecules vaporized from the nucleus should provide samples of molecular abundances that were present at the time of the formation of the Solar System. The Extreme Ultraviolet Explorer spacecraft will make observations of neon and helium for comparison with the water production rates to be measured by the IRTF.

Images from IRTF and many other sources will be posted to a "virtual star party" on the Internet called the "Night of the Comet," sponsored by NASA's Ames Research Center, Mountain View, CA, NASA's Stratospheric Observatory For Infrared Astronomy (SOFIA) program, and its K-12 Internet Initiative. This home page allows anyone with access to a computer and a modem to post and observe Hyakutake images, track the progress of the comet, converse with NASA experts, learn about astronomy and participate in experiments.

"Although the project is just getting started, the initial response has been tremendous," said SOFIA project educator Bob Hillenbrand. "Virtually every state is covered, plus Puerto Rico, and observers are participating from every part of the globe, including Taiwan, Australia, Africa, Russia, South America and Europe."

"Night of the Comet" can be accessed via the Internet at URL:

http://www.comet.arc.nasa.gov/comet/

Students in California, Virginia, New York, Delaware and Japan have begun a regular campaign of observing Comet Hyakutake using an automated 24-inch telescope at Mount Wilson, CA, through the NASA-supported Telescopes In Education (TIE) project.

"We are scheduling one school or group to observe each day of the week," said Gilbert Clark, TIE project manager and organizer of the comet campaign. He expects the observations to continue, weather permitting, through at least part of April, as the comet moves from an early-morning object in the southwest sky to an early-evening object in the northwest sky.

Students will control the telescope and receive their images via telephone lines at their schools, using desktop computers and commercial software. The software package allows them to perform digital image processing to enhance contrast and other features, as is done with spacecraft images. They will send their observation notes and images to the TIE project's World Wide Web page.

A comet is a small, icy body that orbits the Sun in an elongated orbit that can be disturbed by the on-going orbits of the planets. Resembling a "dirty snowball," a comet typically has a relatively tiny nucleus, often less than six miles across. When radiation from the sun warms a comet, ice particles from its nucleus tend to "steam" outwards, creating a large coma or surrounding atmosphere and a tail of material that streams away from the Sun. In some cases, the coma and tail can be thousands or even millions of miles across, offering dramatic viewing opportunities. Comet Hyakutake has the potential to provide just such a spectacle.

According to the Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, Comet Hyakutake will make the nearest passage to Earth of any comet since 1983, and the fifth closest this century.

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Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

March 26, 1996

VIDEO ADVISORY: V96-31

COMET HYAKUTAKE ANIMATION, F-15 NOZZLE TESTS ON NTV WEDNESDAY

On Wednesday NASA Television will air animation that depicts the path that Hyakutake will follow from March 27 through April 20. Next up will be an interview with Dr. Art Polland, a Solor and Heliospheric Observatory (SOHO) project scientist discussing plans for SOHO to observe the comet. Along with comet features, NASA TV will air a feature and interview discussing new nozzle tests being conducted on an F-15 research aircraft that may lead to improved aircraft performance and control.

The video news file will be aired at noon,EST and replayed at 2 p.m. and 4 p.m. as part of the Shuttle mission flight day video file.

ITEM #1 COMET HYAKUTAKE FLIGHT PATH
Animation of comet path from March 27 - April 20.
ITEM #2: INTERVIEW -- DR. ART POLLAND
SOHO project scientist discusses upcoming observations of Comet.
ITEM #3: REPLAY -- FLY-BY ANIMATION OF COMET HYAKUTAKE
ITEM #4: REPLAY -- IMAGES OF COMET HYAKUTAKE
ITEM #5: NEW NOZZLE TESTS
Flight testing of new thrust vectoring concept on F-15 aircraft.
ITEM #6: INTERVIEW -- DAN GATLIN, PROJECT MANAGER F-15 ACTIVE
Gatlin discusses the benefits new thrust vectoring nozzles.

NASA TV will continue to provide live coverage of the STS-76 Space Shuttle/Mir docking mission. Mission information, as well as ground sighting opportunities, can be found on the Internet and the World Wide Web at the Shuttle home page URL:

http://shuttle.nasa.gov

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
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March 27, 1996

VIDEO ADVISORY: V96-32

COOL SUIT FEATURED ON NASA TV THURSDAY

On Thursday NASA Television will air a feature and interview that highlight the use of NASA technology being used to help victims of Multiple Sclerosis. Technology designed to help regulate astronaut body temperatures while they work in space suits has proved to be beneficial in alleviating the symptoms of Multiple Sclerosis. NASA and Kaiser Electronics Inc., San Jose, CA, are providing four liquid-cooled "cool suits" to the Multiple Sclerosis Association of America.

The video news file will be aired at noon EST and replayed at 2 p.m. and 4 p.m. as part of the Shuttle mission flight day video file.

ITEM #1: COOL SUIT HELPS MULTIPLE SCLEROSIS PATIENTS
Liquid-cooled garments help alleviate symptoms of Multiple Sclerosis sufferers.
ITEM #2: INTERVIEW -- DR. BRUCE WEBBON, AMES RESEARCH CENTER
Space suit expert discusses application of cool suit in alleviating Multiple Sclerosis symptoms.

NASA TV will continue to provide live coverage of the STS-76 Space Shuttle/Mir docking mission. Mission information, as well as ground sighting opportunities, can be found on the Internet and the World Wide Web at the Shuttle home page URL:

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NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

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Headquarters, Washington, DC
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March 27, 1996

RELEASE: 96-58

NASA CALLS FOR SUBMISSIONS FOR 1996 SOFTWARE OF THE YEAR AWARD

NASA is calling for submissions for the 1996 NASA Software of the Year Award to give recognition to software developed and owned by America's space agency.

NASA's Office of Safety and Mission Assurance, Washington, DC, and the Agency's Inventions and Contributions Board (ICB) sponsor the award in which last year's competition resulted in nearly $200,000 being awarded to the winners.

The award, which will include a trophy, a certificate signed by the Administrator, and a monetary award of up to $100,000, will be presented to the author(s) of software in which (1) NASA has an intellectual property interest, (2) it has been supported, adopted, sponsored, or used by NASA, and (3) it is significant to NASA's mission. Software programs must have been legally disseminated as commercial-grade (not alpha or beta phase) products to the public by NASA beginning within the last three years.

Entries will be judged by a NASA Software Award Review Panel comprised of software development experts from all NASA Centers and the Jet Propulsion Laboratory, Pasadena, CA. After their review, the panel will submit their selection(s) to the ICB. The ICB may recommend a monetary award of up to $100,000 for the winner(s) depending on the value of the contribution to government and industry. The award will be presented by Agency officials later in the year.

NASA Form 1329 (ICB Award Evaluation Questionnaire) must be submitted for each entry. Copies of the software, sample applications and data, and descriptive documentation of the package should be included, in addition to evidence demonstrating the impact and degree of innovation and suitability of the entry. This information will be the primary data used by the panel in recommending awards.

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Additional inquiries on award criteria should be made through the NASA Space Act Awards Liaison Officer at any NASA Center or through the ICB. Call (202) 358-2468 for contact names. Entries and supporting material must be submitted no later than May 15, 1996. Each Center will then forward to the ICB the Center's top selection by June 10, 1996.

Information about last year's award recipient and the five runners-up is available on the Internet on: http://www.hq.nasa.gov/office/codei/software.html

-end-

News Release

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For Release

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Headquarters, Washington, DC
(Phone: 202/358-1983)

March 27, 1996

J. D. Hunley
Dryden Flight Research Center, Edwards, CA
(Phone: 805/258-3447)

RELEASE: 96-59

NASA TESTS NEW NOZZLE TO IMPROVE PERFORMANCE

NASA has begun flight testing of a new thrust-vectoring concept on an F-15 research aircraft to improve performance and aircraft control.

NASA's Dryden Flight Research Center, Edwards, CA, expects to fly its F-15 research aircraft equipped with thrust-vectoring nozzles approximately 100 hours over the next two years. The new concept should lead to significant increases in performance of both civil and military aircraft flying at subsonic and supersonic speeds.

The twin-engine F-15 is equipped with new Pratt & Whitney nozzles that can turn up to 20 degrees in any direction, giving the aircraft thrust control in the pitch (up and down) and yaw (left and right) directions. This deflected (vectored) thrust can be used to reduce drag and increase fuel economy or range as compared with conventional aerodynamic controls, which increase the retarding forces (drag) acting upon the aircraft when used for trim.

Another important feature is the nozzles' production-oriented design, which would require minimal changes to be incorporated into current or future aircraft.

Applications of the technology range from both existing and prospective military fighters to the High Speed Civil Transport, a supersonic airliner in its conceptual stages that would carry 300 passengers at 2.4 times the speed of sound.

The new nozzles, installed on Dryden's F-15 Advanced Controls Technology for Integrated Vehicles (ACTIVE) aircraft, underwent ground testing at Edwards on the Air Force Flight Test Center's universal horizontal thrust stand in early November, demonstrating that all systems essential for safe operation of the aircraft are functioning correctly.

-more-

On subsequent flights, Dryden researchers expect to fly at speeds up to Mach 1.85 (1.85 times the speed of sound) and at angles of attack up to 30 degrees. "Angle of attack" is a term used to describe the relationship between the aircraft's body/wings and its actual flight path.

For NASA's flight research, each nozzle is mounted to one of the F-15 ACTIVE's two F100-PW-229 engines, which have modified fan duct cases to provide the additional strength required to withstand the vectoring forces. Installation of the nozzles also required modifications to the aircraft's rear fuselage and main engine mounts.

"This program is an example of government and industry cooperating to bring an important technology to maturity," said Dryden project manager, Don Gatlin.

The research program is the product of a collaborative effort by NASA, the Air Force's Wright Laboratory, Pratt & Whitney, and McDonnell Douglas Aerospace.

EDITOR'S NOTE: Images to illustrate this release are available for news media representatives by calling 202/358-1900.

Still photography is available to support this release. Photos are also available on the Internet under "NASA Dryden Research Aircraft PHOTO ARCHIVE, Dryden News and Feature Photos, URL:

http://www.dfrc.nasa.gov/PhotoServer/photoServer.html

Photos in support of this release:	Color:	B&W:
	96-HC-140	96-H-140
	96-HC-141	96-H-141

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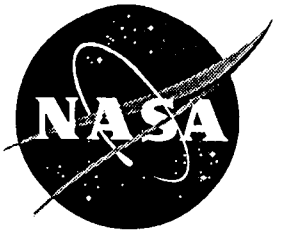

Brian Welch
Headquarters, Washington, DC
(Phone: 202/358-1600)

For Release

March 28, 1996

RELEASE: 96-60

TRAFTON NAMED SPACE FLIGHT ASSOCIATE ADMINISTRATOR

Wilbur C. Trafton today was named Associate Administrator for the Office of Space Flight, Washington, DC, placing him in charge of NASA's Human Exploration and Development of Space Enterprise. Trafton had been serving as acting Associate Administrator since January 26.

"Wil brings great experience and leadership to this office," said NASA Administrator Daniel S. Goldin in announcing the appointment. "He's committed to a vibrant human spaceflight program that provides value and benefit to America." The appointment is effective immediately.

As Associate Administrator for Space Flight, Trafton will be responsible for establishing the policies and direction of NASA's human spaceflight programs.

Trafton was named director of the Space Station program on January 6, 1994. In this position he was responsible for overall planning, budgeting and management of the International Space Station to be built and operated by the United States, Russia, the European Space Agency, Japan and Canada.

In January 1996, Trafton assumed additional responsibilities as the acting Associate Administrator for Space Flight. In his new capacity, Trafton will continue to fill both positions.

Prior to joining NASA, Trafton worked in both the public and private sectors. From 1992-1993, he served as Chief Operating Officer and President of Micro Research Industries, a state-of-the-art computer systems integration and software company in the Washington metropolitan area.

During a 26-year Navy career, Captain Trafton held command and high level staff positions in areas of operations, acquisition, and international affairs. A Naval Aviator, he is a decorated combat veteran. He served as Executive Officer aboard the aircraft carrier U.S.S. Forrestal and as Commanding Officer of the U.S.S. Seattle.

-more-

He was the Executive Assistant to the Commander, Naval Air Systems Command involved in the acquisition of major aviation systems. At the Pentagon, he served as Team Chief for Contingency Planning and Crisis Action for the Joint Chiefs of Staff. In that capacity, he conducted Congressional and Executive Branch liaison for the Chairman, Joint Chiefs of Staff on international issues. As Assistant Chief-of-Staff for Plans and Policy for the Commander, U.S. Pacific Fleet, he coordinated international military and diplomatic negotiations with Pacific Rim nations, including Russia. Captain Trafton led the team that planned and managed the withdrawal of U.S. naval forces from the Philippines.

Trafton is a graduate of the U.S. Naval Academy, Class of 1966. He received a master's degree in Operations Research and Systems Analysis from the U.S. Naval Postgraduate School, Monterey, CA. He also is a graduate of Defense Systems Management College, Ft. Belvoir, VA.

Trafton is married to Mary Grace Schwab. They reside in Alexandria, VA.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

March 28, 1996

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Stephanie Zeluck
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

RELEASE: 96-61

PUBLIC INVITED TO "FLY YOUR NAME TO SATURN"

A high-tech equivalent of a message in a bottle will carry the signatures of thousands of vicarious space explorers when it is launched aboard the Cassini mission to Saturn in 1997.

Volunteer members of The Planetary Society, Pasadena, CA, will help scan the signatures into digital form. The digital data will later be loaded onto a CD-ROM or other digital media, and then will be mounted onto the Cassini spacecraft during its final assembly at NASA's Kennedy Space Center, FL.

Earlier NASA spacecraft such as Viking, Magellan, and Galileo also carried thousands of signatures on other media, but Cassini will be the first to utilize modern digital storage technology. The disc is expected to hold about a million names and should survive well beyond the duration of Cassini's 11-year mission.

"The people who have already sent in signatures think this is a wonderful idea," said Suzanne Barber, administration manager of the Cassini Program. "School teachers love it -- it just seems to capture their students' imaginations, and it offers them a feeling of immortality to be able to send their names into space."

To participate, signatures should be sent on a plain postcard. Multiple signatures per postcard are acceptable. Names will be accepted until January 1, 1997, or until the CD-ROM is full. Postcards should be sent to:

Suzanne Barber
MS 264-441
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109

-more-

Electronic mail transmittals cannot be accepted, and confirmation will be provided only to those who enclose a self-addressed, stamped envelope.

Cassini, scheduled for launch on October 6, 1997, is a joint mission of NASA, the European Space Agency (ESA), and the Italian Space Agency (ASI). It will send an atmospheric probe called Huygens to the surface of Saturn's moon Titan. The Cassini spacecraft will orbit Saturn for four years, gathering data on Saturn, its rings, magnetic environment and moons.

The Cassini home page on the Internet offers a wide variety of information about the mission and the planet Saturn. It can be accessed at:

http://www.jpl.nasa.gov/cassini/

EDITOR'S NOTE: Images to illustrate this release are available for news media representatives by calling 202/358-1900.

Photos in support of this release:	Color	B&W
	96-HC-173	96-H-173

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